A Revision of the Bee Genus *Colletes* in America North of Mexico (Hymenoptera, Colletidae) *

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**Abstract:** This paper consists of a monographic revision of the bee genus *Colletes* in America north of Mexico. It is primarily a taxonomic study although some information is included on the biology of several species, some speculation on the phylogeny and distribution of the genus, and a brief consideration of the nomenclature of the male genital segments.

Previous to this paper some 167 forms had been described from America. An alteration of previous synonymies and revision of existing forms have resulted in the treatment of 95 species and 16 subspecies which are described in detail.

Twelve new species are described: *Colletes aridus*, *C. arizonensis*, *C. beamerorum*, *C. bulbotibialis*, *C. ciliatooides*, *C. kansensis*, *C. longifacies*, *C. micheneri*, *C. mitchelli*, *C. saritensis*, *C. swenki*, and *C. timberlakei*. In addition, two new subspecies are named: *Colletes fulgidus longiplumosus* and *C. punctipennis maurus*.

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INTRODUCTION

The bee genus *Colletes* abounds in America north of the Tropic of Cancer and is widely distributed throughout the world, with the exception of Australia. This study is limited to those species occurring in America north of Mexico, for material from Mexico and the Central American countries is meagre and the areas of collection remote.

The work is primarily of a systematic nature and contributes little to an evolutionary or phylogenetic study of the genus. However, in conjunction with Noskiewicz's (1936) treatise on the Palearctic members of the genus plus a critical treatment of the Latin American fauna, it should form a suitable basis for the inauguration of such a project.

Swenk (1908) published the first extensive systematic paper on the American species of the genus. His work considered twenty-six species possessing some black thoracic pile in either or both sexes. He experienced a great deal of difficulty in obtaining accurately determined material, and recent inquiry indicates that he had opportunity to examine but a few of the types. Despite his effort to avoid the use of chromatic characters for species differentiation, he was occasionally forced to do so; where these lapses occurred the species picture was obscure. In spite of these shortcomings the Swenk work was laudable and unique until the Timberlake papers on Colorado (1943) and California (1951) *Colletes* appeared. In addition to these treatises, several species lists and incomplete keys have been compiled, usually accompanied by descriptions of new species. All, except the Swenk work, are regional in scope and are unsatisfactory to workers outside of the zones covered. The original descriptions are, for the most part, unsatisfactory in the light of present knowledge, frequently referring solely to the color of the body pile and to other characteristics now known to be of infraspecific value only.

As a result, all species are herein redescribed with the exception of a few not available to me and a few known only from single females. These are listed in the text and addenda with their original descriptions. Most, if not all, of the monotypes may eventually prove to be conspecific with better-known species, but further investigation is necessary. An attempt was made to standardize descriptive techniques: holotypes, paratypes, or topotypes, in descending order of availability, were selected for the basic description with variation over the species range recorded in a preamble or postscript
to each description; the first paragraph of the description deals with
the distribution, density, and color of the pile of the body, beginning
at the clypeus and extending progressively caudad, terminating with
an account of the pubescence on the metasomal sterna; the second
paragraph includes a discussion of the integumental morphology of
the insect in the same sequence. In most of the descriptions of spe-
cies a brief summary of the characters of the seventh ventral plates
and capsule of the male is given, and in each of them there is refer-
ence to illustrations at the end of the work.

The locations of the types of the new species are indicated in the
text, and insofar as is possible the paratypes may be found in the
University of Kansas collection, the Canadian National Collection,
the United States National Museum, and my personal collection.

The conventional synonymy precedes the descriptive portion of
each species. Included are some records, obviously erroneous,
that are well out of the known range of distribution for the species.
In some instances I have had an opportunity to examine material
(of Swenk, Graenicher, Criddle, etc.) upon which earlier publica-
tions were based. In an effort to make the work as comprehensive
as possible the reference lists have been included in their entirety.
Where any question exists in my mind on the validity of a specific
record, a clarifying note, in parentheses, follows that item. Refer-
cences to the Cresson (1887), Dalla Torre (1896), and Michener
(In Musebeck et al., 1951) catalogues have not been included for
it is felt that their inclusion would entail unnecessary repetition.

The greatest difficulty in the descriptive phase of this work was
experienced with the color of the body pile. This problem lies not
only in the fact, as Swenk suggests, that “the original color under-
goes a rapid fading, so that a specimen in which the hair of the
thorax and face was of a bright yellowish color when fresh will, in
a short while, fade to pale grey without a tinge of yellow . . .”
but also to an equal or greater extent on the inherent polychromatic
nature of the pile. In a number of species there is so much color
variation that accurate description would necessitate the consider-
ation and subsequent treatment of at least twenty-five per cent of
the individuals. *C. thoracicus* is the prime example of this variabil-
ity. Typically this species has the pile of the body, particularly
of the head and the thorax, uniformly ochreus to ferrugineous, but
in many specimens the pile is tawny or dusky grey much as in the
closely related species *inaequalis* Say. Other individuals of this
species have a few hairs of the mesoscutum and scutellum so deeply
dusky-ferrugineous that they may be confused with black. I suspect that some of this variation can be attributed to fading but this is not the only cause of it. Throughout the genus there are many species in which a little black pile is present on the scutellum or vertex or both of a large percentage of the population but is absent in other individuals. Similarly, variation in the intensity of yellow pigmentation of the pile often occurs on specimens taken in a single area during a single flight season.

There is little doubt that the presence of abundant black hairs, whether on the face, vertex, or thoracic dorsum, serves as a character of value. However, I doubt whether it is of much phyletic significance. The presence of black pile in some species in many diverse groups merely indicates that the character has arisen independently and repeatedly during the evolution of the genus.

Hazardous, as a specific character, is the use of slight differences in the density of body pubescence. With age many, if not all, species lose pile, probably because of abrasion during the construction of their nests. The thoracic and metasomal terga are most susceptible to repeated contact and, consequently, the metasomal fasciae are often reduced or absent, depending on the age and sex of the specimen. Despite its limitations, I do not advocate that consideration of the body pile be eliminated in species determination, but caution against its use and when possible would restrict it to the secondary role of characters to be employed principally in substantiation of conclusions based on other morphological characters.

A number of characters regularly used previously in species recognition have also proved unreliable when generally applied. Those dealing with the intensity of color of some morphological structure are of little value, except when applied to species of a restricted range. The degree of melanism varies in the general body color of the insect; in the coloration of the underside of the flagellum; in the extent of red and black on the apices of the mandibles; in the color of the nervures of the wing; and in the shade of the tarsi and tegulae. These have all proved equally unsatisfactory for the more widely distributed species, and reference to such characters has been kept to a minimum.

Difficulty in species recognition is by no means restricted to chromatic variation. In the widely distributed species minor variations are found in the punctuation of the clypeus and vertex, the sculpture of the basal area and posterior face of the propodeum, the
patternning and pitting of the metanotum, and the pectination of the spurs of the hind tibiae to the extent of negating or impairing the use of the structures as specific characters. Again, it must be emphasized that the above characters become increasingly useful in species of restricted distribution, where geographical variation becomes a negligible factor.

NOTES ON MORPHOLOGY OF THE MALE GENITALIA

The variation in terminology of the various structures of the primary copulatory organs of the male is disturbing; the list of terms is resplendent with synonyms and appears to be increasing with each of the more recent papers. Crosskey (1951) has done little to clarify the situation with his introductory statement, “It has been conclusively shown that the male genitalia of Hymenoptera are entirely phallic in origin.” Few morphological problems in entomology remain so unsettled. His failure to consider the basic contributions by Crampton (1919, 1920, 1938), Singh-Pruthi (1925, 1929), and Michener (1944) leads one to consider the statement no more than a personal expression of satisfaction with the conclusions of Snodgrass (1941). Despite the uncertainty that enshrouds the homologies of the primary copulatory organs I find the work of Michener and Crampton much more plausible than claims for exclusive phallic origin of the capsular structures. Michener (1944) wrote: “Holometabolous insect larvae do not have ‘legs’ on the ninth abdominal segment, which is the segment upon which the claspers are situated, or if appendages are present as in the larvae of Trichoptera, they give rise to claspers. It seems certain then, that at least the outer claspers, and the inner ones as well except possibly in Orthoptera, are, like the gonopore, associated with the ninth abdominal segment.” The appendages which do eventually appear on the ninth segment in Hymenoptera are presumed to be serially homologous to the “legs.” As Michener points out, the copulatory organs are much less likely to be new structures of phallic origin than derivatives of pre-existing structures.

The terminology used in this paper to describe the primary copulatory organs (capsule) is that of Michener with slight modification. Frequent reference is made to the membranous expansions, or wings, of the penis valves for they offer excellent specific and group characters. The ventral wing is broad and readily distinguishable in all species except C. ciliatus Patton, in which it is reduced to a semilunar preapical expansion. A number of species, particularly those
of the consors group, also have the dorsal margin of the penis valves broadly convoluted and extended laterally in a plane parallel to the ventral wings. These two expansions I have termed the dorsal and ventral wings of the penis valves. This is done despite Timberlake’s previous use of the term “lateral wing” for the ventral lamina. As both wings often occur as lateral projections I feel that the use of “lateral wing” would eventually add to the confusion. I have followed Snodgrass’ terminology for the apical portions of the volsellae, i. e., cuspis for lateral process, digitus for median process (Figure 87).

Noskiewicz (1936) based his capsular nomenclature on the work of Strohl (1908) and frequently referred to appendicular terms as employed by Schmiedeknecht (1882-1884). An attempt to synonimize the various names used by the principal workers in dealing with the copulatory structures of Hymenoptera is shown in Table I.

I have treated the seventh metasomal sternum as being composed of two separate plates attached to a narrow transverse basal apodeme. Throughout the genus the two plates are united at their mediobasal margins. The seventh ventral plates, despite their simplicity, are undoubtedly the most useful morphological structures for species differentiation, and I have arbitrarily applied names to portions of the plates for ease in verbal description. The rounded basal points of attachment I have termed the “basal articulatory condyles” because of their condylar shape and their presumed function in articulating the plates with the body. The apical portions of the plates are broadened and possess dorsal pubescent cov-

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**TABLE I**

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<tr>
<th>Michener (modified)</th>
<th>Snodgrass</th>
<th>Schmiedeknecht</th>
<th>Strohl</th>
<th>Timberlake</th>
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<tr>
<td>gonobase</td>
<td>basal ring</td>
<td>cardo</td>
<td>cardo</td>
<td>stipes</td>
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<tr>
<td>gonocoxite</td>
<td>parameral plate</td>
<td>stipes</td>
<td>(valvae</td>
<td>apical segments</td>
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<tr>
<td>gonostylus</td>
<td>parameres</td>
<td>lacinia</td>
<td>external</td>
<td>of stipes</td>
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<tr>
<td>penis valves</td>
<td>sagittae</td>
<td>sagittae</td>
<td>sagittae</td>
<td>sagittal rods</td>
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<tr>
<td>dorsal wing</td>
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<td></td>
<td>lamellae</td>
<td>dorsal wing</td>
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<td>ventral wing</td>
<td>volsellae</td>
<td>valvae internal</td>
<td>lateral wing</td>
<td>volsellae</td>
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<td>volsellae</td>
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<td>cuspis</td>
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erings of variable density and distribution. The length, density, and distribution of the hair patterns offer excellent differentiating characters. Attempts were made to illustrate all plates with accuracy; in a few species the hair pattern may be slightly overemphasized to aid in their recognition. These broadened apical portions of the plates are referred to as “discs.” Occasionally reference is made to a usually petiolate sector between the disc and condyle, termed the “neck” (fig. 86).

Noteworthy is the unique nature of the seventh ventral plates of *C. thoracicus* Smith, a sibling species of *inaequalis*, that is found along the eastern and southern seaboard of the United States. There are a few minor external features by which these species can be separated, but occasionally genitalic examination is necessary. The most interesting feature of *thoracicus* is the fact that it shows striking intraspecific variation in the form of the seventh ventral plates. The plates may be weakly trilobate with the lateral lobes free along the median margins, partially fused to the median lobes, or united completely to form a bilobate apex. This is the only species in which exceptions in these characters have been observed within populations, although subspecific differences occur rather frequently. The material examined shows that the variation occurs at random throughout the range, to such an extent that it is impossible to tell which of the three forms predominates.

**BIONOMICS**

The species of *Colletes* are solitary, tending to be semigregarious in selection of their nesting sites, exhibiting, as far as is known from the few kinds studied, species preference for certain soil types and textures.

The conditions believed most primitive are those common to the various groups of species known in America today. The gregarious tendency; the simple, straight nesting tube probably not extending more than a foot below ground level and having the cells in a row; the well-mixed pollen and nectar supplies in each cell; and the complete lining of the nest tunnel with salivary excretions appear to constitute the more basic ancestral characteristics. Unfortunately biological data are so sketchy that one must be overimaginative to attempt even so much as group phylogeny with the material at hand.

*C. inaequalis* Say is the only American colletid on which a creditable amount of information has been accumulated, and from these
data we can assume the species to have undergone considerable evolution from its progenitors.

Several contributions have been made to the biological knowledge of this species of Colletes, of which the most outstanding is the work by J. B. Smith (1900, 1901). (The original determination of the species as C. compacta by W. J. Fox was in error, as was substantiated by Swenk's re-examination of the Smith material.) Interesting but incomplete information on C. compactus Cresson by Phil and Nellie Rau (1916), and on C. rufithorax (= thoracicus Smith) by Parker and Boving (1924), has shed some light on the biology of these two species but much more observation is necessary before either can be considered to be complete.

Two papers by Friese (1912, 1922) contain summaries of part of the biological knowledge of the Palearctic Colletes fauna. Both works deal with C. daviesanus Smith, a widespread species of northern and north central Europe and Asia. Malyshev (1923, 1927) and Müller (In Noskiewicz, 1936) contributed abundantly to the life history of C. cunicularius L., a very close relative of the Neartic C. inaequalis. It is not at all remarkable to find the biologies of these two species almost identical.

An excellent treatise on the biologies of several species of South American Colletes is given by Claude-Joseph (1926), and extracts of that paper are presented below.

Some additional data on C. inaequalis, obtained by me during the spring of 1951 in Douglas County, Kansas, supplement the Smith paper on the life history of this species. I remain indebted to Dr. Smith for a great deal of that which follows and, to maintain coherence, have omitted the quotation marks where his information was used.

The species was first noted in abundance on the 20th of April in Kansas, a full month later than those observed by Smith. Groups of 15 to 30 mounds of sand and silt were found by chance along the margin of a wheat field in the lowlands along the Kaw River. From the color of the exposed sand and a knowledge of the soil strata, it was calculated some burrows were at least 18 inches deep and that others were in the process of excavation. During the two weeks following the first observation, little mounds appeared in abundance all along the sheltered margin of the field, with few extending into the open adjacent wheat field. Males were noted in great numbers at the time of the first visit, hovering constantly over and about the excavations, but for some obscure reason they would become less
and less obvious towards noon. Very few males were noted in the afternoon but the next morning they reappeared in droves and repeated the violent buzzing about the nests. The earlier the hour, the closer they flew to the ground. It was assumed that the males were awaiting the appearance of emerging females, but during the days which followed no actual coition was observed. During these first few days the females did not leave the nests but would frequently come to the opening and bask in the sun. Occasionally the female would descend and in a few minutes the abdomen would become visible and the hind and middle pairs of legs would violently fling the sand from the entrance. The reaction of the occupants was noted on several occasions where the mouth of the nest had been damaged; and in each instance after the tunnel had been cleared the bee would move up and down, with its mouthparts and fore legs working vigorously close to the tunnel wall as if it were in the process of applying a very thin adhesive. The species is known not to line the tunnel with visible quantities of material, but it may secrete a very fine film to strengthen the walls leading to the cell. Partial verification was obtained on the excavation of a number of nests in which the sandy-silt tunnel walls adhered more closely than the surrounding medium; often pieces of the tunnel could be removed intact.

On the second day of observation the females began gathering pollen and presumably nectar, each trip falling into a similar pattern. The female would project the head and then the thorax slowly, as if in fear of a foe. If a shadow fell across the mouth of the tunnel or the observer moved, the bee hurriedly clambered down the hole and used the head as a plug. Finally, when left undisturbed the bee would emerge, circle the entrance once or twice, and leave for the food source. The return to the nest was usually direct, but on a number of occasions the female would become lost, in which case she would circle the area, often settling and walking over the soil to enter first one, then another burrow. This process was repeated, at times requiring up to 20 minutes, before she found her own nest. There was considerable variation in the time required for a female to secure a load, depending presumably upon the supply of pollen and nectar as well as the distance to the source. One female required 13 minutes to return laden and another took 47, the mean time per trip approximating half an hour. The deposition of the collected food required much less time, some emerging 4 minutes after entering the tube. Again, however, there were great differ-
ences in the time required to emerge. One bee remained in the burrow for 1 hour 5 minutes before reappearing; it was assumed that the female was in the process of sealing a cell and preparing another.

By the 3rd of May many of the burrows were filled in and the flight activity of both sexes had become reduced. Contrary to Smith's observations there was no preponderance of males following the cessation of female activity.

Later, burrows in use were traced, each yielding meagre finds. The first and second tunnels ended barely 12 inches below the surface in partially completed cells and despite continued digging yielded nothing. A third excavation was made on filled-in observation burrows, known to contain good supplies of pollen. The first 22 inches of the tunnel were followed without too much difficulty until the first (actually the last formed) cell was reached. The female had apparently filled the tunnel with light-colored sand surrounding the burrow entrance and the solidly packed yellow sand stood out well in the darker sandy silt. There is evidently no common form to the burrow, for the first 12 inches curved weakly from a vertical orifice and the last 10 inches ran almost parallel to the soil surface. Another curved sharply 3 inches below the surface, ran sub-horizontally for a few inches, and then dropped almost vertically another 18 inches before the first cell was found. Still others curved weakly throughout their length. Below this first cell the path of the tunnel was nowhere evident and excavation was continued by carefully removing layers of soil from an area two feet in diameter. As many as five cells were uncovered from a single burrow, each lying on separate horizons below the last-formed cell, and in no instances were these cells in line. The deepest cell was 34 inches below ground level; cells from the nests examined were separated by as much as 12 inches in a horizontal plane and 5 inches vertically. Smith's statements seem most logical to account for this pattern in *inaequisalis*. The bee digs down from the first to the extreme depth of the burrow, then runs off to one side for two to four or rarely six inches, makes and fills a cell, and lays an egg in it. Two or three inches higher another lateral is started, running in a different direction, and the sand taken from this lateral is dropped into the main tube, from there it washes into the first lateral so that when the second is completed the first is well filled. The second lateral is filled with material from the third if a third is run and, finally, the entire tube is filled.
Five of the eleven cells unearthed were undamaged and were taken to the laboratory; three had been torn open in the process of removal, two were infested with ants, and one had desiccated. The cell is approximately 15 mm. in length and 5 mm. in diameter, with the distal end rounded and the proximal end abruptly truncate, at times weakly concave. In texture the capsule, made presumably of salivary secretion, was thin and transparent, tending to show little pliability and tearing easily. It may serve to protect against soil organisms, dirt, and desiccation.

Claude-Joseph states that the viscous substance making up the membrane is secreted by glands at the base of the tongue, under the clypeus. It then descends by vessels to the terminal lobes and opens into the ciliated zone, which spreads it in a fine film.

The food stored in the brood cells is a pasty mixture of nectar and pollen, probably derived from a number of sources visited by the female, e. g., *Cercis canadensis*, *Salix*, *Prunus*. The cell is half-filled with food, and the egg, which is large, is attached to one side of the cell by one end and so curved that the opposite tip rests on the surface of the food mass. The egg is slightly more than 3 mm. in length. After the egg is laid, the upper end of the cell is closed by means of a flat disc, which is set in a little from the ragged upper edge. Smith calculates that the interval from the beginning of the burrow until the first egg is laid is from 18 to 20 days.

Two cells were found in which the larvae had just hatched; attempts to rear these to maturity failed. The young larvae retained a position very similar to that of the egg for a long time, with the mouthparts resting on the surface of the soupy food mass. Many of the cells taken up a month after the active flight dates were undoubtedly from the earliest burrows; hence the egg stage is an unusually long one.

On July 1 Smith unearthed four cells in which the larvae were so far developed that they came near to filling the cell. The bulk of the food store had been devoured and growth must have been nearly completed. Unfortunately further samples could not be obtained later in the season, and the date of pupation is thus left undetermined. It is uncertain whether the insects reach the adult stage in the fall and winter in the ground, or whether they winter as mature larvae and change to pupae and adults very early in spring.

Malyshew (1927), working with *C. cunicularius*, reports the following observations on that species: "... At the end of July,
July 27, 1917, in the vicinity of Kursk, I found a single cell occupied by *Colletes* which contained an unpigmented pupa. Three other cells were found in Borisowka on July 2, 1917, containing white pupae with pigmented eyes.

"The first young bee was noted in a nest in mid August which I had kept under observation since April. By digging the thawed out earth (March 29, 1916 in Borisowka) I found a matured male. Excavations on April 6, 1917 yielded two cells with females prepared for flight, four cells with mature, living larvae and more earth filled cells from previous years. Thus the development of the larvae was observed. On the 8th of July, 1917 the larva transformed into a pupa and on the 22nd of July, that is two weeks later, it had wings and had transformed into the adult female. The latter overwinters without leaving the cell. *C. cunicularius* overwinters either in a mature stage (which appears to be customary) or in a stadium of the resting larva (diapause). . . ."

In view of the close relationship that exists between *cunicularius* and *inaequalis*, it would not be remarkable to find *inaequalis* exhibiting similar variation in its overwintering form.

Observations on *C. succinctus* L. by Mayet (1875) indicate that the males are first to emerge, and search for the females much as those of *inaequalis*. Once fertilized, the females begin to construct their nests, employing a used burrow or starting at a new site. The sand is loosened with the mandibles and is ejected from the burrow by means of the legs and by curving the abdomen under the body. A gallery may be constructed in a single day when new nests are being formed or in several hours when the bee utilizes an old burrow. The cell is formed as in *inaequalis* and requires eight to ten trips to fill. The bee disgorges the nectar with some force, and a specimen placed in a glass tube dispelled the nectar in a small stream to the end of the tube. After the egg is laid, the cell is closed and covered with several layers of material similar to that which forms the rest of the cell. The larva of this species begins feeding in the fall and continues to develop the following spring. Pupation occurs about the middle of August. The adult bee emerges fifteen days after pupation and remains within the cell for about six days. It then breaks its way into the gallery, where it remains for ten to twelve days before emerging to mate.

*C. daviesanus*, differing greatly from the above, was found by Friese (1912) to tunnel "in vertical sand stone and clay walls. The circular path runs diagonally down in the layer of sand and curls
to one side at the end, reaching almost 10 cm. into the wall. The inner wall of this round burrow is painted with a hardened liquid which upon examination proved to be a very fine spun lining which covers the inner wall of the nest and is then painted with saliva. In this setting the bee deposits the gathered pollen and seals off a single cell with a hyaline lid, which forms the arched base of the following cell; in this way the individual cells form a tube, with one segment projecting into the other. . . . One finds as many as 10 such cells joined in a brood chamber but more often less; other authors have reported 20 cells per brood chamber. . . . The nests, which were formed during the previous July and August, have half-grown larvae by the spring of the next year (March 28). With the advent of warmer weather, the larvae begin to eat the remaining pollen, working from the center to the outside of the cell, and reach their full growth by the middle of May. I observed the first pupae, with only the eyes pigmented on June 11th . . . and by the beginning of July the pupae were further pigmented and hardened so that I expected free flying stages by middle July; however it was July 27th before there were abundant numbers in flight.”

Michener (in litt.) reports that at Montara, California, *C. fulgidus longiplumosus* Stephen nests in great numbers in banks and that the cells are constructed end to end in the burrows as in *C. daviesanus*.

A few nests were unearthed in the vicinity of Ottawa, Canada, during the summer of 1950 and had the tunnel lined with a material of cellophanelike texture. The species is believed to be *C. kincaidii* Cockerell.

Claude-Joseph’s (1926) thorough report on the Chilean species of *Colletes* exemplifies the diverse habits of the genus in that locale. The galleries generally are cylindrical, winding, often branched, and usually deep, with branching or winding characteristic for each species. The cells occupy the ends of the galleries or their branches and may be isolated or deposited in linear series. Linear series of 4 to 8 cells are not uncommon in *araucariae* Friese, *cyanescens* Hal., and *bicolor* Smith, whereas others have pectinate or bifurcate nesting tubes with single cells terminating each short branch. One of the most interesting sites is that of *C. ciliatus* Friese, which is found in the vacated cement abodes of *Odynerus humeralis* or in the dry branches of *Peumus* and *Kageneckia* spp. The cellular membrane is semitransparent and glistening and varies in turgidity with each species. Each cell is constructed completely, except for its cover, before provisioning is begun. Apparently both nectar and pollen
are collected in a single trip, for when the bee returns to the cell the insect turns around so that the abdomen faces the bottom of the cell, and combs the pollen from the posterior femora. It then turns its head about and digorges the nectar, mixing it little by little to obtain a sweet paste. When the bee has gathered the quantity desired it excavates the surface of the paste and deposits its egg. The larva of *C. araucariae* was observed to move feebly over the surface of the paste, eating slowly into its food, and disappearing within two or three weeks.

Once the egg has been laid the bee begins to form the closing membrane to the capsule. The tongue is touched against the cellular margin and a droplet of a viscous substance is deposited; the bee then lowers its head vertically and pulls up a fine thread across the opening. With continuous to and fro movements across the entrance, it forms a series of threads which transverse it in all ways. The tongue again passes over the threads thus formed, but this time the viscous material oozes from its lobes into the pores of the web, forming a thin membrane over the top of the cell.

The egg hatches within a couple of weeks, depending upon the amount of heat absorbed by the soil. After maturity the larva remains immobile for several weeks, during which digestion and assimilation proceed slowly. Then a period of reactivation sets in and a yellowish fluid flows from its mouth. This substance is spread by the buccal organs all about it and against the cell walls to form a secondary envelope, in which it pupates. The apparent inactivity lasts for the duration of metamorphosis.

Unlike *inaequalis*, the Chilean species never close the galleries that lead to their nests, and at the most gather a few grains of sand in front of the last-formed cell. This condition leaves an open door to a number of hymenopterous and dipterous parasites.

Noskiewicz is obviously in error in stating that all *Colletes* have but one generation per year, for among the American species many have a spring and a fall generation, *e.g.*, *texusus* Cresson, *wickhami* Timberlake, *birkmanni* Swenk, *louiase* Cockerell, *daleae* Cockerell. The presence of spring emergents (*inaequalis* Say, *etc.*), summer emergents (*kincaidii* Ckll., *etc.*), and fall emergents (*compactus* Cress., *etc.*) well fills the seasonal niches available to them.

Of the Nearctic species many are recorded from only one host plant, but considerable field observation is necessary upon most of these for which a single plant record exists. However, for several species there are abundant data, which imply oligolectic tendencies.
I am reasonably certain that the species *C. aestivalis* Patton and *C. andrewsi* Cockerell are oligolectic on the flowers of *Heuchera spp.*, as they have been taken only from *H. americana* and *H. hispida*. Several listed below are also considered oligolectic until subsequent collection information proves otherwise.

*C. albolescens* Cresson on *Amorpha; C. distinctus* Cresson on *Ilex; C. ochraceus* Swenk on *Eriogonum; C. wilmatteae* Cockerell on *Petalostemon; C. saritensis* Stephen on *Dalea*.

Other species exhibit preference for one or more families of flowers, but the great majority are polylectic, deriving their food from a variety of unrelated plants.

The knowledge of the parasites of Nearctic *Colletes* is very meagre, and only a few records are found in the literature. Parker and Boving’s (1924) paper on the life history of *Triurania sanguinipes* on *C. rufithorax* is unique in this phase of *Colletes* biology. The principal parasites of *Colletes* spp. are the bees of the genus *Epeolus*, but so sketchy is the information that no idea exists as to the degree of infestation under normal conditions, or any data on their biologies.

Bischoff (1930), reporting on *Epeolus* spp. in the European region, found considerable minor polymorphism among the members of a single species, and says on this topic, “A problem for the future will be to ascertain the existing and failing constancy of our middle European species to the native hosts and to what extent these same species can live on different hosts.” He is apparently uncertain of the cause of the polymorphism, stating, “About the minor differences of the individual form, one can be in doubt whether it is a question of food or different host species.” Without settling the question raised by Bischoff, Noskiewicz, on the basis of observation, is of the opinion “that in many cases one and the same *Epeolus* species can have different *Colletes* species as hosts.”

In addition to the two genera mentioned above, Blair (1920) records the following as parasites of *C. daviesanus* Smith: Diptera; *Bombylius minor* L., *Milto gramm a punctata* Meig.: Coleoptera; *Meloe*: Hymenoptera; *Chrys is cyanea* L.

Claude-Joseph reports *Epeoloides* sp. and *Is epeolus* sp. as parasites on *C. musculus* Friese; *Is epeolus* sp. and *Anthrax* sp. as parasites on *C. laticeps* Friese. He also lists *Coelioxys* as being a general parasite of this genus.
DISTRIBUTION AND PHYLOGENY

Generalizations and deductions are always subject to criticism because of their tentative nature. In the absence of fossils the possibility is remote that there can be conclusive substantiation for any phylogenetic “tree” rooted beyond the near past. However, the accumulation of a multitude of implications, meaningful but far from complete, cannot be ignored. An attempt is made to interpret the data at hand without resorting to dogmatic conclusions.

Though some difference of opinion exists concerning the most primitive group of apoids, there is little doubt that members of Paracolletini are the progenitors of the Colletini. The present distribution of this primitive group is panastral; they are found in temperate South America, Australia, and southern Africa. Colletes, however, is found throughout the world with the exception of Australia, suggesting that the genus arose after the submergence of the land bridge between Australia and continental Asia, probably during the late Cretaceous. This would still have permitted the genus to originate in Africa, South America, or at some marginal locality of its predecessor, a form presumably similar to Paracolletes.

It is frequently possible to ascertain the center of origin of a group, with some reliability, from distribution patterns. However, many genera display a center of variation and species frequency far removed from their point of origin. This appears to be the case in Colletes, for though there is a distinct numerical superiority of species in western North America, such diversity is also found in other areas exhibiting similar habitat diversification (Spain, Turkestan). In these areas, the isolation of populations has probably resulted in rapid fixation or even in nonadaptive genetic combinations, which alone would hardly offer suitable evidence from which one could determine a generic center.

The following text includes 108 species and subspecies, the great majority of which are restricted to continental America north of Mexico. Eleven species are known to extend into Mexico, but further collections should reveal upwards of 45 species or subspecies occurring in both the United States and Mexico. Only one species is suspected to be common to the Palearctic and Nearctic regions. This species, C. impunctatus Nylander, is found across the northern portions of Asia and Europe, whereas its Nearctic counterpart, C. impunctatus lacustris Swenk, appears to be restricted to the Hudsonian and Canadian zones of America. Further consideration is given the problem later in the text.
Adhering closely to distributional patterns of many other Nearctic insects, the species of *Colletes* are most abundant in the diversified habitats west of the 105th meridian. Of the 108 species, 72 are known to occur in this region, approximately 55 being restricted to it. I believe that the majority of species of this region, certainly the *daleae* and *consors* groups, either arose in this region or resulted from a northward migration of parental stock from the Mexican Plateau at some time during the Tertiary.

Noskiewicz' illustrations of the seventh ventral plates of Palearctic *Colletes* show less diversification of basic form than exhibited by Nearctic species; and the derivation of the Palearctic fauna, treated by him, from Nearctic sources is well within the realm of probability. He states: “According to our present knowledge it appears that the genus *Colletes* is much stronger in Asia than Europe or Africa. Of the 123 species worked by me, 54 are purely Asiatic, 20 European, 15 North African: 19 species are Eurasian, 6 Eurafriican, 8 occur in Europe, Asia and Africa and only one species is found exclusively in Africa and Asia. If these numbers are totalled we have 82 [species] in Asia, 53 in Europe and 30 in North Africa.” The progressive numerical decrease in species number and the reduction in morphological complexity as one retreats from North America towards Africa lend additional weight to the claim for a New World origin of the genus.

On the same topic it is interesting to note that the *nigricans* group (Noskiewicz), which predominates in the Mediterranean regions, has undergone a tremendous reduction in morphological complexity, particularly in the copulatory structures of the male: the volsellae (fig. 1, plate XIV, Noskiewicz) appear to be absent but are probably greatly reduced; the gonocoxites are simple, composed of what appears to be an uninterrupted segment; the gonostyli are broadly fused to the gonocoxites with no evident line of separation and the seventh ventral plates of the metasoma are weakly lobate, lacking the complexities of the more primitive types.

This group, including all species with unsegmented gonocoxites, is restricted to the regions about the Mediterranean Sea extending from the Canary Islands on the west to Transcaopia on the east. It appears to be superimposed upon a continuum of diverse species having the single common characteristic of segmented gonocoxites. Such a localized group evolving towards lines of greatly increased simplicity near one of the areas harboring the primitive paracolletine
ancestral types would minimize, but not eliminate, the probability of African origin.

There is little doubt in my mind that the major part of the North American Colletes fauna originated as successive adaptations of Neotropical forms (i.e., americanus, simulans, latitarsis, consors, and daleae groups). Their distribution is largely restricted to southern North America. The uniqueness of these groups, the absence of close Palearctic relatives, and the existence of Central American relatives contribute to such a hypothesis.

However, in contrast to these groups there exist groups of related forms occurring in both parts of the Holarctic region. The broadly distributed species of the inaequalis group in North America (particularly inaequalis Say and validus Cresson) have a close morphological and biological resemblance to the groups formosus, cariniger, and cunicularius as described by Noskiewicz. [A detailed examination of the descriptions of the species in the latter groups as well as the illustrations of the seventh ventral plates for each species convinces me that Noskiewicz has overemphasized the subdivisions at the group level. The three groups, comprising a total of five species, have a continuous, nonoverlapping distribution from Siberia to North Africa; they are, without exception, early spring bees like C. inaequalis, and are very close morphologically. It appears that he has used single characters of perhaps no more than subspecific importance to differentiate groups and even subgenera. For example, the three groups mentioned are separated from a close ally, the acutus group, on the basis of the length of the malar space, the color of the hind legs and tarsi, absence of abdominal fasciae, and length and density of body pile. I have found none of these characters useful except for species separation. C. cunicularius, which resembles inaequalis most closely, is found from Siberia to Germany, its subspecies C. c. infuscatus Noskiewicz in Spain and Italy; C. formosus Pérez is known from Tripoli and Algeria and C. cariniger Pérez (seventh plates identical with those of formosus) has been taken from Syria and Egypt. In the series of species mentioned there is a progressive loss of the trilobate aspect of the seventh ventral plates with the median lobe undergoing greatest reduction.]

If it is assumed that simplicity and reduction are indicative of recent origin, inaequalis Say may be considered the most primitive species of these groups. Its broad distribution throughout the Nearctic region, the polylectic habits of the species, and its stability in
America suggest an invasion of the Palearctic region probably during Tertiary times, giving rise to the members of the four groups listed above.

The reverse seems the case with *C. impunctatus lacustris* Swenk, occurring in the boreal region of North America, and *C. impunctatus impunctatus* Nylander from Siberia, which are so close morphologically that I do not hesitate to reduce the former to a subspecies of the latter. This distribution, unlike that of the *inaequalis-cunicularius* complex, is presently nearly continuous. Here, however, the broad dispersal of forms allied to *impunctatus* from Switzerland and Sweden to India and Siberia, accompanied by the restricted zone occupied by *lacustris* in North America and its lack of close relatives in America, would indicate a migration from Eurasia to North America.

Although I have had little opportunity to examine Old World material, I expect that further investigation will reveal that members of the *hyalinus* group, and possibly others, have Holarctic distribution and that one or perhaps several independent migrations to and from America have taken place during the middle and late parts of the Tertiary.

Nearctic Distribution: The distributional patterns of the genus in America are similar to those of a number of other genera. The most common of these patterns is exemplified by the two species complexes *lutzi* and *consors* (maps 6 and 7), which abound in the higher altitudes of California, about the northern edge of the Great Basin, and along the Continental Divide. No doubt the *consors* group, restricted to a montane habitat, follows the migratory path of the Boreal and Transition zones through Colorado and Wyoming, whence it skirts the Great Basin to terminate in the Cascades of Washington and the Sierra Nevada of central California. On the basis of present data *lutzi* follows a pattern similar to that of *consors* from Colorado to California.

A third species, *hyalinus* Provancher, in which three subspecies are recognized, presents a disjunct and confusing pattern. The species, as known to date, occupies the northern plains region of America and the western lowlands of California and Oregon (Map 5). To my knowledge, no continuum exists between *h. hyalinus*, east of the Divide, and either *h. oregonensis* Timberlake or *h. gaudialis* Cockerell on the west, but the resemblance is so apparent that I must agree with Timberlake (1951) when he says, "Renewed study of *C. hyalinus* (sensu stricto) and *C. gaudialis* convinces me that
they are similar enough to be races of one species and the probability of intergradation is enhanced by the presence in Oregon and along the coast of northern California of the somewhat intermediate form *C. h. oregonensis*.” Records from Matanuska on the coast of Alaska and White Horse in the Yukon may prove the species to extend up the coast to the north, forming a continuum in the far north. Though this is possible, it appears equally probable that further collections may reveal a continuous cline to extend through a series of river channels and mountain valleys from east to west.

A fourth pattern, apparent in the distribution of the *simulans* group, is thought to have its stem in Mexico. The northerly migration into America follows a three-pronged route from the southern Rocky Mountain region: (1) a northerly mountain route into Colorado and Wyoming, (2) a westerly path into the lowlands of Nevada and California, whence it has migrated as far north as the valleys of British Columbia, and (3) a broad adaptation to the plains regions of America east of the Continental Divide (Map 1).

The region of origin of the *texanus* subgroup is obscure but their close relationship to the rest of the *consors* group would weigh heavily in favor of a thesis supporting their derivation from a Mexican form similar to *consors*. They are without exception restricted to the lower Sonoran zone from western Texas to California.

A number of distribution maps have been included in the present work in an attempt to clarify the ranges of those species in which confusion has already arisen or is likely to arise. In most instances two or more sibling, or closely related, species have been plotted on the same map to illustrate more clearly areas of overlap and limits of the ranges. Other maps have been prepared for species in which subspeciation has given rise to complex patterns, *e.g.*, *simulans* Cresson, *consors* Cresson, *hyalinus*. Known marginal records have been plotted for the more common species. Areas are shaded to indicate the recorded as well as suspected range of the group in question.

A similar procedure has been followed in presenting distributional data in the text. When the range is broad and material abundant, only peripheral localities are noted, but for the less common and new species complete collection information is recorded. For the most part the two recorded extremes serve to delimit the seasonal flight period of the species and where information is available the peak of the flying population is noted.
GEOGRAPHICAL VARIATION

The observed details of geographical variation among the various species have been recorded under the species. Most of the widespread species seem to vary to some degree geographically; only where the variation is rather obvious and consistent are subspecies recognized. In a few instances subspecies are listed that would probably not have been recognized except for the fact that names had already been applied to them.

There is no obvious consistent association of the variations with geographic or climatic factors. Thus no ecological rules, such as those readily devised for coloration, size, and proportions in various groups of vertebrates, wasps, butterflies, etc., apply consistently to the variations in Colletes. Generally, the populations from arid western habitats are paler in ordinary body pile, in the pale covering of the abdomen, and in the wings than their near relatives from more humid areas. *C. consors mesocopus* Swenk and *C. nigrifrons* Titus may be cited as exceptions to this general rule, in which paler forms are found in more humid areas. There are, of course, a few widespread rather invariable species as well.

MEASUREMENTS

Frequent reference is made to the lengths of the antennal or flagellar segments in both the descriptions and the keys. Unless indicated otherwise, the dorsal surface of any of the medial flagellar segments is taken as a standard.

Considerable difficulty was encountered in measuring the length of the malar space. In all species the width of the malar space is the distance between the anterior and posterior mandibular articulations. For the most part the length is considered to be the distance represented by a perpendicular line running from the anterior mandibular articulation to the compound eye (Figure 85). However, in many species the compound eye is narrowed below, and if the malar space is broad this perpendicular line reaches well up along the inner orbital margin. In such cases the length is taken as the distance between the line joining the mandibular articulations and a parallel line running through the mediobasal corner of the compound eye (Figure 85). The corner is hardly angulate but sharply rounded and distinct.

Measurements of total length and wing length given in descriptions are usually means. Extremes are not indicated for they mean little, especially for the body, where much depends on the degree
of telescoping of the abdomen. In most species the smallest individuals are about 3 millimeters shorter than the largest.

DESCRIPTION OF THE GENUS

Swenk (1908) has given an excellent account of the history of the name _Colletes_ and of its genotype (_C. succinctus_ Linnaeus), and Griffin (1935, 1938) has verified information on the dating of the principal works involved.

The subgenera proposed by Cockerell, Friese, and Noskiewicz are for single species or very small groups (up to 3 species) which are aberrant in certain respects. In no way do they represent major divisions of the genus into its principal phyletic lines, but rather are names provided for unusual terminal branches of these lines. As yet the phylogeny of the genus as a whole has not been sufficiently elucidated to make recognition of the principal lines of descent possible. Until this is done, it seems best to synonymize the subgeneric names.

_Colletes_ Latreille, 1802, Histoire naturelle des fourmis, p. 423.
_Type: Apis succineta_ Linnaeus. Monobasic.
_Type: (Apis calendarum Panzer) = Apis succineta_ Linnaeus. Monobasic.
_Type: _Colletes nasutus_ Smith. Monobasic.
_Type: (Colletes maculipennis Friese) = _Colletes spiloptera_ Cockerell. Monobasic.
_Type: _Colletes graeffei_ Allken. Monobasic.
Proposed without genotype designation and therefore invalid under article 25 C of International Rules of Zoological Nomenclature.

Head and thorax with pile long and dense; metasomal terga usually fasciate; posterior femora of female with long dense pollen brush; labrum broader than long with median concavity, often delimited by thickenings on either side; subantennal sutures directed towards inner margins of antennal sockets; facial foveae present, most evident in female, of variable width, nonpilose and depressed; galeae short; submentum broad and elongate; labial palpi short, 4-segmented, first segment 1¼ times as long as second, others subequal; glossa short, broad, bifid, strongly emarginate medially; maxillary palpi 6-segmented; eyes concave along inner orbital margins; pre-episternal sutures complete; metanotum horizontal, in same plane as scutellum and basal area of propodeum; propodeum with narrow horizontal basal area, smooth or longitudinally carinate,
posterior face with a 3-cornered, shiny, depressed, nonplumose median area, pointed below; wings hairy; pterostigma large; marginal cell with apex not on wing margin; fore wings with three submarginal cells, first equal to second and third together in length, second and third subequal in length; vein second m-cu at right angles to Cu₁ and strongly arcuate outward in posterior portion; pygidial and basitibial plates absent; inner hind tibial spurs strongly toothed or combed; eighth metasomal (ninth abdominal) sternum of male roughly equilaterally triangular; capsule with gonocoxites usually transversely divided (always in Nearctic species); gonostyli usually distinct and pilose apically; gonobase large; penis valves enlarged basally, tapered apically with dorsal and/or ventral "wings"; volsellae large and distinct (in Nearctic species).

GROUPINGS WITHIN THE GENUS

The morphological uniformity of the genus indicates no obvious major phyletic lines of descent; however, a number of small aberrant groups are readily recognizable. To facilitate the separation and treatment of the members of the genus, the species were placed in natural groups and the groups arranged consecutively in what appears to be a phyletic order of descent.

It is difficult to outline briefly the basis of these divisions, for a multitude of characters are concerned and the resulting group characters would tend to be as exhaustive as the species descriptions. The principal factor influencing the assignment of the species to a group was the structure of the male genitalia; this includes the form of the seventh ventral plates, size and shape of the gonostyli, structure of the penis valves and wings, and shape of the gonocoxites. Secondary group characters include the size of the flagellar segments, size and structure of the clypeus, presence of metapleural prominences, body puncturation, etc. At times one or two characters are sufficient in separating the groups, but for the most part a consideration of the general body morphology is necessary. Because of the last-mentioned point it is believed that the comprehensive treatment necessary for characterizing the groups that follow would not add appreciably to the context.

Groups I to XVI are composed of several closely-related species, and groups XVII to XIX are each represented by a single species. The latter three groups are strongly divergent and show little resemblance to any of the groups preceding them. It might have been
covered. For the sake of uniformity this was not done, and the groups are listed in the order of their appearance in the text. A desirable feature would have been a key to the groups. This, however, would have been unsatisfactory from the standpoint of species separation, for in the vast majority of cases there were no obvious group characters that could be directly applied to a workable key. I feel that such a key would add to the complexity rather than ease the burden of determination.

The groups and their component species are as follows:

Group I *productus*
- *productus* Robertson
- *arizonensis* Stephen
- *cercedii* Timberlake
- *rudis* Timberlake

Group II *compactus*
- *compactus* Cresson

Group III *latitarsis*
- *latitarsis* Robertson

Group IV *simulans*
- *simulans* Cresson
- *angelicus* Cockerell
- *fulgidus* Swenk
- *rufocinctus* Cockerell
- *lousiae* Cockerell
- *bryanti* Timberlake
- *birkmanni* Swenk

Group V *aestivalis*
- *aestivalis* Patton

Group VI *robertsonii*
- *robertsonii* Dalla Torre
- *metzi* Timberlake
- *timberlakei* Stephen

Group VII *nudus*
- *nudus* Robertson
- *carolinus* Mitchell

Group VIII *americanus*
- *americanus* Cresson
- *annae* Cockerell
- *laticinctus* Timberlake
- *bradleyi* Mitchell
- *mitchelli* Stephen
- *ochraceus* Swenk
- *tectiventris* Timberlake
- *gypsicolens* Cockerell
- *albescens* Cresson

Group IX *hyalinus*
- *hyalinus* Provancher
- *lutzi* Timberlake

Group X *distinctus* Cresson

*perileucus* Cockerell
*gilensis* Cockerell
*skinneri* Viereck
*vandykei* Timberlake
*punctipennis maurus* Stephen
*slevini* Cockerell
*eulophi* Robertson
*kincaidii* Cockerell
*trigonatus* Cockerell
*utilis* Cockerell
*delodontus* Viereck
*wootoii* Cockerell
*andrewsi* Cockerell
*larreae* Timberlake
*turgiventris* Timberlake
*kansensis* Stephen
*brimleyi* Mitchell
*aberrans* Cockerell
*hovardi* Swenk
*susannae* Swenk
*sartensis* Stephen
*thysanellae* Mitchell
*wilmattae* Cockerell
*micheneri* Stephen
*mandibularis* Smith
*solidaginis* Swenk
*distinctus* Cresson
*phaceliae* Cockerell
Group X inaequalis
  inaequalis Say
  thoracicus Smith
validus Cresson
Group XI impunctatus
  impunctatus lacustris Swenk
Group XII willistoni
  willistoni Robertson
brevicornis Robertson
Group XIII consors
  consors Cresson
  paniscus Viereck
  nitescens Timberlake
  californicus Provancher
  nigrifrons Titus
  xerophilus Timberlake
  sphaeraleae Timberlake
wickhami Timberlake
chamaesarachae Cockerell
scopiventris Swenk
texanus Cresson
swenki Stephen
linsleyi Timberlake
Group XIV intermixtus
  intermixtus Swenk
bulbotibialis Stephen
Group XV ciliatus
  ciliatus Patton
  beamerorum Stephen
ciliatoides Stephen
Group XVI daleae
  daleae Cockerell
  algarobiae Cockerell
deserticola Timberlake
clypeonitens Swenk
petalostemonis Swenk
covillaeae Timberlake
prosopidis Cockerell
salicicola Cockerell
solitarius Timberlake
Group XVII aridus
  aridus Stephen
deserticola Timberlake
Group XVIII titusensis
  titusensis Mitchell
Group XIX longifacies
  longifacies Stephen
petalostemonis Swenk
prosopidis Cockerell
solitarius Timberlake

KEY TO THE MALES

To facilitate the separation of the species, three of the most distinctive natural groups are removed in the first three couplets. It would have been desirable to separate each of the nineteen groups in this manner, but this proved impractical, for there are no distinctive characters applicable to all of the species within each group.

Couplets 1, 2, and 3 require some explanation, as many of the species of these large natural groups (americanus group, consors group, and daleae group) removed by these couplets are not always recognizable by one or two obvious characters. Unfortunately, in both keys several species that have a striking resemblance in the critical key characters have been taken out with the americanus and consors groups, although they are not members of these groups. This was done to facilitate the separation of species in which key
characters are likely to be confusing. It should be noted that all species foreign to but occurring in the couplets stated to be members of the *americanus* or *consors* groups are also found elsewhere in the key. The following explanatory material is therefore provided:

Forms which should go to couplet 70 (*americanus* group) exhibit the following characters: malar spaces no longer than broad; flagellar segments one and one-quarter to one and three-quarters times as long as broad; clypeus uniformly curved and densely punctate with striate or ovate punctures; propodeum with the lateroposterior margins abrupt or ridged, not rounded; pile of body all light; seventh ventral plates with discs quadrate to weakly triangular; penis valves with narrow ventral wings; gonostyli short, triangular.

Forms which should go to couplet 88 (*consors* group) exhibit the following characters: malar spaces no longer than seven-eighths as long as broad; flagellar segments short, about as long as broad; propodeum with basal area narrow and sloping rather sharply ventrally, lateral and posterior faces finely striate and roughened, rounded at lateroposterior margins; pile of body long and dusky grey, often intermixed with black on head and thorax; seventh ventral plates roughly quadrate, or reduced to short transverse discs; penis valves with broad dorsal and ventral wings; gonostyli short, roughly triangular.

Forms which should go to couplet 108 (*daleae* group) exhibit the following characters: malar spaces at least as long as broad; flagellar segments at least as long as broad; clypeus elongate with longitudinal median sulcus bordered by lateral shiny, sparsely punctate rims; sulcus densely punctate, rims sparsely punctate with round punctures; propodeum with basal area smooth and broad, usually not sharply pitted but with a few weak longitudinal rugae, lateral and posterior faces shiny with numerous fine punctures; body covered with long white pile; species all small, less than 9 mm. in length, found only in western part of the Great Plains and Lower Sonoran zone of North America; seventh ventral plates quadrangular or weakly modified to triangular, discs covered with fine short pile; penis valves with only ventral wings, wings small; gonostyli virtually absent, evident as slightly expanded apical processes.

1. Metableura each with dorsal prominence or horizontal carina, usually with testaceous rim, and malar spaces no longer than broad (*Flagellar segments longer than broad*) .......................... 70

Metableura with no dorsal prominence or if weakly prominent with carinae curving ventrally well in front of posterior
margins, if having rimmed prominence then malar spaces one and one-half times as long as broad.............. 2

2(1). Median flagellar segments usually as long as broad or slightly longer, and penis valves with broad dorsal and ventral wings, Median flagellar segments usually at least one and one-half times as long as broad; if shorter, penis valves lacking dorsal wing ............... 88

3(2). Clypeal punctures sparse and round and clypeus with longitudinal median sulcus; propodeum with basal area broad and smooth, occasionally with a few weak longitudinal rugae .................. 108

Clypeal punctures elongate, at least apically, or, if not, clypeus without any indication of a sulcus; propodeum with basal area deeply pitted ............... 4

4(3). Mesoscutum, scutellum, or inner orbital margins with varying amounts of black pile 5

Mesoscutum, scutellum, and inner orbital margins with pile all light ............... 29

5(4). Malar spaces at least as long as broad, usually longer .............. 6

Malar spaces no longer than three-fourths as long as broad.............. 12

6(5). Malar spaces at least one and three-fourths times as long as broad; mesepisterna dull and roughened (Prothoracic spines absent) validus

Malar spaces less than one and one-half times as long as broad; mesepisterna punctate with shiny interspaces ............... 7

7(6). Metasomal sterna two to four emarginate medially; pile of body dusky; malar spaces slightly longer than broad (Tergal fasciae very weak and dusky) impunctatus lacustris

Metasomal sterna two to four with posterior margins entire; pile of body white to tawny; malar spaces one to one and one-half times as long as broad .................. 8

8(7). Mesepisterna dull and roughened, obscurely punctate ............... 9

Mesepisterna coarsely punctate with shiny interspaces ............... 10

9(8). Propodeum with posterior face outside of triangle rugose above; metasomal terga with discs having abundant short, erect, black pile; thorax with pile long, dense, and ochreous; seventh ventral plates with lateral lobe short and at times partially fused to median (fig. 56) thoracicus

Propodeum with posterior face outside of triangle dull and roughened; metasomal terga with discs having pile white to pale grey; thorax with pile long, fine, and pale grey on periphery; seventh ventral plates tripartite apically, lateral lobes long and broadly separated from median lobe (fig. 55) inaequalis

10(8). Inner orbital margins with admixture of black pile (Malar spaces one and one-quarter times as long as broad; clypeus with deep median longitudinal sulcus and impunctate lateral rims) compactus

Inner orbital margins with pile all light ............... 11
11(10). Malar spaces one and three-eighths times as long as broad; seventh ventral plates laterally quadrate with long latero-basal “tail” and distinct neck (fig. 7) (Metasomal terga one and two coarsely and densely, almost contiguously, punctate) skinneri

Malar spaces as long as broad; seventh ventral plates longitudinally quadrate, lacking necks between discs and articulatory condyles, discs about twice as long as broad (fig. 19), bryanti

12(5). Posterior basitarsi short, no more than two and one-half times as long as broad ........................................ 13
Posterior basitarsi about four times as long as broad ........................................ 15

13(12). First metasomal tergum shiny, weakly folliculated (with a distinct metallic blue lustre); posterior basitarsi two and one-half times as long as broad ....................... intermixtus
First metasomal tergum densely punctate with shiny interspaces, punctures about one puncture width apart; posterior basitarsi two times as long as broad ........................................ 14

14(13). Wings pictured; neotropical, reaching southern Texas, punctipennis mauro
Wings not pictured; American Great Plains ........................................ laitarsis

15(12). Dorsolateral fringes of propodeum with strong admixture of black pile ........................................ 16
Dorsolateral fringes of propodeum with pile all light ........................................ 17

16(15). Length 8.5 mm.; mesepisterna with pile exclusively light; metasomal tergum one sparsely and finely punctate on anterior median face ........................................ arizonensis
Length 13.5 mm.; mesepisterna with abundant black pile on upper faces; metasomal tergum one uniformly densely punctate, punctures no more than one puncture width apart, candykei

17(15). Prothoracic spines long and sharp, at least as long as width across bases ........................................ 18
Prothoracic spines short, vestigial or obliquely truncate ........................................ 24

18(17). Vertex and mesoscutum with abundant black pile; length 11-14 mm. (Body coarsely punctate) ........................................ 19
Vertex with pile all light; mesoscutum with but few black hairs; length 8-10 mm. ........................................ 20

19(18). Metasomal tergum two with sharp basal depression; metasomal tergum one deeply, almost contiguously, punctate; clypeus striately punctate with shiny interspaces gilensis
Metasomal tergum two not depressed basally; metasomal tergum one shiny, punctures deep but separated by at least one and one-half puncture widths; clypeus deeply, contiguously punctate with no shiny interspaces ........................................ nudus

20(18). Propodeum with posterior face shiny, striately rugose, forming deep pits dorsally outside of triangle; seventh ventral plates with discs twice as broad as long, apices broadly concave (fig. 33) carolinus
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Propodeum with posterior face dull and roughened or smooth and shiny; seventh ventral plates with discs at least as long as broad .................................................. 21

21(20). Propodeum with basal area flat and smooth with few longitudinal rugae, not at all quadrately pitted; metasomal tergum one shiny, impunctate .................. perileucus

Propodeum with basal area deeply quadrately pitted; metasomal tergum one finely punctate ................................................................. 22

22(21). Metasomal tergum one finely and sparsely punctate, punctures one and one-half to two puncture widths apart; seventh ventral plates short, roughly triangular (fig. 51) ............... hyalinus

Metasomal tergum one coarsely and densely punctate, punctures no more than one puncture width apart; seventh ventral plates elongate, at least twice as long as broad, quadrate .... 23

23(22). Penis valves with ventral wings truncate apically, coterminus with valve apices; seventh ventral plates quadrate with apical margins strongly expanded, almost lobate (figs. 12, 13, 14) .................. simulans

Penis valves with ventral wings narrowed apically, weakly pointed; seventh ventral plates quadrate with apices broadly rounded, not lobate (fig. 16) ............... fulgidus

24(17). Prothoracic spines obliquely truncate with posterior margins extending beyond anterior (Second metasomal tergum with weak basal fascia) .................................. angelicus

Prothoracic spines short or absent, not truncate .................. 25

25(24). Propodeum with posterior face shiny, striately rugose, forming deep pits dorsally outside of triangle ............................................. 26

Propodeum with posterior face dull and roughened, not striate or pitted outside of triangle ................................................................. 27

26(25). Seventh ventral plates laterally extended, median and lateral margins strongly reflexed; discs of plates about twice as broad as long (fig. 33); malar spaces three-quarters as long as broad ........................................ carolinus

Seventh ventral plates elongate, at least twice as long as broad with strong laterobasal projections (fig. 16); malar spaces five-eighths as long as broad .................................................. fulgidus

27(25). Mesepisterna dull and roughened, punctures obscure; sternal fasciae weak and incomplete .................. inaequalis

Mesepisterna coarsely punctate with shiny interspaces, punctures about one-half puncture width apart; sternal fasciae complete, dense, and white ........................................ 28

28(27). Propodeum quadrately pitted with deep shiny pits outside of triangle; black pile restricted to a few black hairs on scutellum; mesepisterna weakly rugosely punctate; seventh ventral plates roughly quadrate (fig. 4) ............... rudis

Propodeum with basal area smooth, not pitted outside of triangle; black pile abundant on mesoscutum and scutellum; mesepisterna coarsely punctate with shiny interspaces; seventh ventral plates broadly triangular with apical margins broadly rounded (fig. 3) .................. cercidii
29(4). First metasomal tergum shiny, impunctate, or, if punctate, with a few scattered folliclelike punctures especially laterally

First metasomal tergum closely punctate, punctures no more than two puncture widths apart

30(29). Eyes with inner orbital margins nearly parallel (Mesepisterna and metasomal terga dull, obscurely punctate)

Eyes with inner orbital margins strongly convergent below (First flagellar segment no more than one-half as long as second)

31(30). Posterior basitarsi very long and broad, about two and seven-eighths times as long as broad; prothoracic spines absent; length 13-15 mm. andrewsi

Posterior basitarsi long and narrow, about four times as long as broad; prothoracic spines short and sharp; length 11-12 mm. aestivalis

32(30). Malar spaces at least as long as broad

Malar spaces shorter, no more than three-quarters as long as broad

33(32). Metapleura protuberant above with narrow black rim; propodeum coarsely rugose with large pits on posterior and lateroposterior faces outside of triangle productus

Metapleura not protuberant above; propodeum finely roughened, not pitted outside of triangle hyalinus

34(32). Propodeum coarsely rugose, roughened, forming large pits on upper posterior face outside triangle; mesepisterna coarsely rugosely punctate

Propodeum finely roughened or smooth outside triangle, never pitted; mesepisterna deeply punctate with shiny interspaces

35(34). Flagellar segments short, as long as broad; malar spaces linear titusensis

Flagellar segments about one and one-half times as long as broad; malar spaces at least three-eighths as long as broad

36(35). Malar spaces three-fourths as long as broad; seventh ventral plates with discs broader than long, weakly quadrate (fig. 34) brimleyi

Malar spaces three-eighths as long as broad; seventh ventral plates longer than broad, roughly triangular (fig. 53), distinctus

37(34). Flagellar segments about as long as broad (Seventh ventral plates with discs transverse and narrow, sharply excavated apically (fig. 75)) aridus

Flagellar segments at least one and one-half times as long as broad

38(37). Penis valves with broad dorsal and ventral wings; seventh ventral plates elongately rectangular, twice as long as broad (fig. 67) wickhami

Penis valves lacking dorsal wing; seventh ventral plates never longer than wide

39(38). Prothoracic spines short or vestigial; nervures light brown; length 11-14 mm. danae

Prothoracic spines sharp, at least as long as width across base; nervures dark brown to black; length 8.5-9.5 mm.
40(39). Malar spaces two-thirds as long as broad; metasomal terga impunctate ........................................... *larceae*
   Malar spaces one-half as long as broad; metasomal terga with sparse coarse punctures ......................... *turgiventris*

41(39). Propodeum with basal area deeply quadrately pitted; meta-
   somal tergum one sparsely punctate; terga shiny black; meta-
   somal fasciae weak and narrow; head and thorax with pile fuscous and sparse (Length 8.5 mm.) .................. *hyalinus*
   Propodeum with basal area nearly smooth, not pitted; meta-
   somal tergum one impunctate; terga shiny blue-back; meta-
   somal fasciae dense and white; head and thorax with pile white .......................................................... *perileucus*

42(29). Malar spaces linear to one-fourth as long as broad; metasomal terga closely, often contiguous, punctate to lateral margins (Apical fasciae in abrupt declivous depressions) ............... 43
   Malar spaces at least one-third as long as broad; metasomal terga variable, never continguously punctate .......... 47

43(42). Prothoracic spines at least as long as width across base; pile of head and thorax long and white; metasomal tergum one coarsely punctate .......................................................... 44
   Prothoracic spines short or absent; pile of head and thorax short, dense, and tinged with ochreus; metasomal tergum one very finely punctate ................................................................. 46

44(43). Seventh ventral plates transverse, apical margins broadly ex-
   cavated and fringed with long, light ochreus pile (fig. 27), *robertsonii*
   Seventh ventral plates with apical margins expanded or com-
   plex ................................................................................................................................. 45

45(44). Seventh ventral plates with basal portions transverse as in *robertsonii* but with transverse lobes attached to medio-
   apical processes (fig. 30) ................................................................. *metzi*
   Seventh ventral plates with apical margins expanded, tending to membranous, plates roughly quadrate, narrowed later-
   ally (fig. 31) .................................................................................................................. *timberlakei*

46(41). Mesepisterna dull, shallowly obscurely punctate, especially be-
   low; seventh ventral plates fully semilunar (fig. 72); tegulae light hyaline; penis valves with ventral membranous wings
   absent except for small preapical piece ................................................................. *ciliatus*
   Mesepisterna distinctly punctate with shiny interspaces; seventh ventral plates narrowed, almost sickle-shaped (fig. 73);
   tegulae deep brown; penis valves with broad ventral wings, *beamerorum*

47(42). Posterior basitarsi short, about two and three-fourths times as
   long as broad and curved longitudinally; posterior tibiae ex-
   panded medially, constricted towards base and apex (Gly-
   peus long, flat, shiny, sparsely and finely punctate; seventh ventral plates roughly triangular with apices sharply emar-
   ginate (fig. 71)) ................................................................................................. *bulbotibialis*
   Posterior basitarsi at least three and one-half times as long as
   broad and straight; posterior tibiae not constricted apically, 48
48(47). Metasomal tergum two uniform from base to apex, not depressed basally .................................................. 49
Metasomal tergum two depressed basally, with or without basal fascia ............................................................... 50

49(48). Mesoscutum and scutellum with dense covering of ochreous to yellow pile, obscuring surface; mesepisterna dull, roughened; malar spaces three-fourths as long as broad. *thoracicus*
Mesoscutum and scutellum with pile white to tawny; mesepisterna coarsely punctate with shiny interspaces; malar spaces one-half as long as broad. *turgicentris*

50(48). Malar spaces at least seven-eighths as long as broad .............................................. 51
Malar spaces no more than three-fourths as long as broad .............................................. 60

51(50). Metasomal tergum one with punctures deep, punctures about one puncture width apart or less .............................................. 54
Metasomal tergum one with punctures fine, shallow, and separated by at least two puncture widths .............................................. 52

52(51). Prothoracic spines sharp, length at least one and one-half times width across base .............................................. 53
Prothoracic spines short, triangular (Wings whitish hyaline; seventh ventral plates with discs cordate and with laterobasal projection at bases of discs and necks (fig. 18)). *louisae*

53(52). Seventh ventral plates as long as broad, roughly triangular; gonostyli about as long as width across base (fig. 51). *hyalinus*
Seventh ventral plates with discs twice as long as broad, roughly quadrate with lateral margins broadly rounded; gonostyli two and one-half times as long as broad (fig. 21), *slevini*

54(51). Malar spaces long, about one and one-fourth times as long as broad (Metasomal terga with discs covered with white or light-grey pile; tegulae light ochreous hyaline). *wootoeni*
Malar spaces about as long as broad, or shorter .............................................. 55

55(54). Seventh ventral plates short and broad, about as broad as long; gonostyli no longer than broad .............................................. 56
Seventh ventral plates at least twice as long as broad; gonostyli two and one-half times as long as broad .............................................. 58

56(55). Malar spaces as long as broad; metasomal tergum two strongly depressed basally with weak basal fascia (Seventh ventral plates with discs slightly broader than long, surface with uniform covering of fine pubescence (fig. 54)). *phaceliae*
Malar spaces no longer than three-fourths as long as broad; metasomal tergum two with no basal fascia .............................................. 57

57(56). Length 8 mm.; body densely covered with long white pile; seventh ventral plates with lateral hair bands strongly developed and broadly united to median band basally (fig. 51); lowland species. *hyalinus*
Length 7 mm.; body with pile sparse and grey; seventh ventral plates with lateral hair bands weakly developed, not broadly united to median band basally, pile of lateral bands short (fig. 52); montane species. *lutzi*
58(55). Seventh ventral plates with distinct petiolate necks between discs and articulatory condyles
Seventh ventral plates lacking necks between discs and condylyar articulations, discs broadly united to condyles (fig. 19) (Mesepisterma densely, coarsely, contiguously punctate above; body with pile usually strongly tinged with ochreus) ........................................... bryanti

59(58). Seventh ventral plates with abrupt lateral shoulders at latero-basal margins of discs, strongly emarginate beneath (fig. 23) ........................................... kineaidii
Seventh ventral plates uniformly curved about lateral margins of discs (fig. 22) ........................................... eulophi

60(50). Seventh ventral plates with discs as broad as long; gonostyli short, no more than one and one-half times as long as width across the bases
Seventh ventral plates with discs twice as long as broad, roughly quadrate; gonostyli long and slender, two and one-half times as long as width across base ........................................... 61

61(60). Malar spaces one-third as long as broad; penis valves with narrow dorsal wings; gonostyli broader than long (fig. 74), ciliatoides
Malar spaces at least one-half as long as broad; penis valves with no dorsal wings; gonostyli about one and one-half times as long as broad ........................................... 62

62(61). Metasomal tergum two with weak basal fascia; seventh ventral plates with discs slightly broader than long, lateral margins broadly rounded, discs with uniform covering of fine pubescence (fig. 54) ........................................... phacellae
Metasomal tergum two with no basal fascia; seventh ventral plates with discs roughly triangular, lateral margins straight, discs with pile most dense along lateral and median margins ........................................... 63

63(62). Body densely pilose with long white pile; seventh ventral plates with lateral hair bands well developed and broadly united to median bands basally, pile of lateral bands long (fig. 51); lowland species ........................................... hyalinus
Body with pile sparse and tawny to white; seventh ventral plates with lateral hair bands weakly developed, not united to median band basally, pile of lateral bands short (fig. 52); montane species ........................................... lutzi

64(60). Prothoracic spines vestigial, triangular or obliquely truncate at apex ........................................... 65
Prothoracic spines long and sharp, at least as long as width across base ........................................... 69

65(64). Prothoracic spines obliquely truncate with posterior margins extending beyond anterior (Metasomal tergum two with weak basal fascia; seventh ventral plates with strong latero-basal projections (fig. 15)) ........................................... angelicus
Prothoracic spines sharply pointed or vestigial ........................................... 66
66(65). Malar spaces three-fourths as long as broad; wings whitish hyaline with little pubescence; metasomal tergum one with few coarse punctures, at least two puncture widths apart on disc (Seventh ventral plates with long necks between discs and condyles, discs cordate with laterobasal projections at junction of discs and necks (fig. 18)) ............. *louisae*

Malar spaces less than five-eighths as long as broad; wings dusky with abundant testaceous pubescence; metasomal tergum one distinctly punctate with punctures one and one-half puncture widths apart .............................................. 67

67(66). Seventh ventral plates elongate, roughly ovate with short neck and lacking laterobasal projection (fig. 20) ............. *birkmani*

Seventh ventral plates elongate, roughly quadrate, with no neck between discs and condyles ......................................................... 68

68(67). Metasomal tergal discs four to six with long, erect, light pile; metasomal terga one and two with apical fasciae narrow and weak; seventh ventral plates lacking laterobasal projections (fig. 17) ............. *rufocinctus*

Metasomal tergal discs four to six with erect fuscous to black pile; metasomal terga one and two with apical fasciae broad and dense; seventh ventral plates with strong laterobasal projections (fig. 16) ............. *fulgidus*

69(64). Seventh ventral plates elongate, roughly ovate, weakly shouldered but with no laterobasal projections (fig. 20) ............. *birkmani*

Seventh ventral plates elongate, roughly quadrate, expanded apically with strong laterobasal projections (figs. 12, 13, 14), *simulans*

70(1). Lower edge of metapleural prominence with a broad rim which hangs down and obscures surface beneath it in lateral view ............................................. 75

Lower edge of metapleural prominence weakly protuberant with a narrow rim which projects laterally ........................................... 71

71(70). Seventh ventral plates transverse, narrow, with long, dense apical fringe of fuscous pile (fig. 29); tegulae black; metapleural prominence abrupt, heavily rugose including rim, *kansensis*

Seventh ventral plates roughly quadrate in form; tegulae light brown hyaline; metapleural prominence weakly protuberant, not rugose ................................................................. 72

72(71). First metasomal tergum impunctate or weakly punctate medially ............................................. 73

First metasomal tergum densely punctate (Malar spaces three-fourths as long as wide; abdomen and thorax with pile dusky to yellow; length 10-11 mm.) ............. *howardi*

73(72). Vertex and mesoscutum with admixture of black pile; hypoeppimeral area abruptly protuberant; flagellar segments short, about as long as broad ............. *thysanellae*

Vertex and mesoscutum with pile all light .................................. 74
74(73). Malar spaces three-fourths as long as broad; body covered with long, dense, white pile; seventh ventral plates quadrangular, weakly rounded laterally (fig. 40); length 9-10 mm., *gypsicolens*
Malar spaces one-third as long as broad; body covered with short, sparse, dusky pile; seventh ventral plates almost square (fig. 58); length 7-8 mm. .................. *mitchelli*

75(70). First metasomal tergum with disc distinctly punctate, punctures no more than three puncture widths apart at mid-line, First metasomal tergum with disc impunctate and shiny, or, if punctate, punctures weak and sparse and follicle-like ............. 76

76(75). Femora, tibiae, and tarsi yellow testaceous (Mesepisterna distinctly punctate with shiny interspaces; metasomal terga two to five with discs having abundant erect ferrugineous pile) ............................... *vilmatiae*
Femora and tibiae dark or largely so, tarsi occasionally tinged with yellow ............................................................. 77

77(76). Anterior edge of pronotum raised and protruding as an erect plate, most evident as an abrupt process above the coxal bases; prothoracic tergum very broad with anterior and posterior edges raised slightly to form a broad, weakly convex tergum (Prothoracic spines absent) ................................................. *aberrans*
Anterior edge of pronotum flat, tergum narrow and flat .......... 78

78(77). Flagellar segments short, about one to one and one-fourth times as long as wide; first metasomal tergum with disc deeply punctate, punctures no more than two puncture widths apart at mid-line .......................... 79
Flagellar segments long, at least one and one-half times as long as wide; first metasomal tergum with punctures three puncture widths apart at mid-line, one puncture width apart laterally (Prothoracic spine long; nerves dark brown), *mandibularis*

79(80). Second metasomal tergum with broad basal fascia; first metasomal tergum densely and uniformly punctate, punctures no more than one puncture width apart ........................................... 80
Second metasomal tergum with no basal fascia; first metasomal tergum with disc coarsely punctate, punctures about two puncture widths apart; prothoracic spine short and sharp; nerves deep brown ................................................. *saratensis*

80(79). Prothoracic spines long and sharp, at least as long as width across bases; pile of body tinged with ochreus; North Carolina ........................................... *howardi*
Prothoracic spines very short or absent; pile of body pure white; Great Plains ................................................. *susannae*

81(75). Malar spaces as long as broad; first metasomal tergum impunctate ................................................................. 82
Malar spaces no more than three-fourths as long as broad; first metasomal tergum variable ..............................
82(81). Mesoscutum with punctures mesal from parapsidal lines, shallow and at least two puncture widths apart .......... *micheneri*
Mesoscutum with punctures mesal from parapsidal lines, no more than one puncture width apart (Mesepisterna with punctures coarse and dense on upper half) .......... 83

83(82). Wings whitish hyaline with pubescence light .......... 84
Wings dusky with abundant dusky pubescence .......... 86

84(83). Seventh ventral plates roughly quadrangular with apical margins broadly rounded, pilose on median and lateral reflexed faces; malar spaces three-eights as long as broad (fig. 50), *latincinctus*
Seventh ventral plates quadrate with apical margins truncate; variably pilose; malar spaces one-fourth as long as broad 85

85(84). Propodeum with basal area sloping sharply ventrally, not pitted but having irregular longitudinal rugae; seventh ventral plates longer than the width from median to lateral extremities, plates quadrate with narrow hyaline nonpilose area at the latero-basal margins (fig. 57) .......... *tecticentriss*
Propodeum with basal area not sloping sharply ventrally, broadly quadrately pitted; seventh ventral plates short, slightly broader than long with lateral margins weakly rounded and pilose (fig. 36) .......... *annae*

86(83). Rims of metapleural prominences narrow and testaceous; seventh ventral plates with discs extended laterally, about two and one-half times as broad as long (fig. 49) .......... *solidaginis*
Rims of metapleural prominences broad and testaceous; seventh ventral plates with discs roughly quadrate, never more than one and one-half times as broad as long (fig. 35) .......... 87

87(86). Mesepisterna coarsely contiguous punctate on upper half; pile of body dense, partially concealing surface; southern coastal areas of California .......... *ochraceus*
Mesepisterna with punctures above, separated by narrow, roughened, shiny interspaces; pile of body sparse, not concealing the surface; America east of Continental Divide .......... *americanus*

88(2). Face with black pile intermixed along inner orbital margins; legs with strong admixture of black or fuscous pile .......... 89
Face with pile white to tawny grey; legs with pile white to pale grey (except c. consors) .......... 92

89(88). Prothoracic spine long and sharp; mesepisterna with pile entirely black; metasomal terga with no apical fasciae. *californicus*
Prothoracic spine short or vestigial; mesepisterna with pile pale grey; metasomal terga with white apical fasciae at least on first two segments .......... 90

90(89). Legs and discs of metasomal terga three to six with abundant erect black pile .......... 91
Legs and discs of metasomal terga three to six with pile white to pale grey .......... *paniscus paniscus*
91(90). Malar spaces one-half as long as broad; mesoscutum and scutellum with pile tawny grey, no dark hairs intermixed; seventh ventral plates roughly quadrate, densely covered with long, laterally directed pile. ......................... consors pascoensis
Malar spaces three-fourths as long as broad; mesoscutum and scutellum with pile tawny, intermixed with a few black or dark hairs on the disc; seventh ventral plates with apical margins broadly rounded, laterobasal margins weakly pointed, plates with transverse median bands of pile. (fig. 62) ........................................... paniscus

92(88). First metasomal tergum coarsely and densely punctate, punctures no more than one puncture width apart; mesoscutum coarsely, densely, almost contiguously punctuate ......................... 93
First metasomal tergum with punctures fine or absent, when present, punctures at least two puncture widths apart, surface at times roughened and punctures obscure .............................................. 102

93(92). Metapleura weakly protuberant above, protuberance strongly rugose; body coarsely and densely punctate; metasomal terga with discs having abundant short erect black pile ......................... 94
Metapleura not protuberant above; body variably punctate, punctures not uniformly coarse over entire body; metasomal terga with discs having covering of light pile ................................................. 98

94(93). Clypeus short, strongly convex; flagellar segments one and one-third times as long as broad; length 12-14 mm. ......................... 95
Clypeus flattened on median surface; flagellar segments as long as broad; length 8-10 mm. ................................................. 97

95(94). Seventh ventral plates transverse, apical margins broadly excavated and fringed with long, light ochreous pile (fig. 27), robertsonii
Seventh ventral plates with apical margins expanded or complex .................................................................................. 96

96(95). Seventh ventral plates with basal portions transverse as in robertsonii but with transverse lobes attached to medio-apical processes (fig. 30) .......................................................... metzi
Seventh ventral plates with apical margins expanded, tending to membranous, plates roughly quadrate, narrowed laterally (fig. 31) .......................................................... timberlakei

97(94). Metasomal terga one to three with distinct narrow preapical grooves followed by raised flangelike margins; antennal segment three one and one-half times as long as four; malar spaces linear ................................................. brevicornis
Metasomal terga one to three with apex smooth, not grooved; antennal segment three subequal to four; malar spaces one-third as long as broad ................................................. willistoni

98(93). Malar spaces at least one-half as long as broad, usually longer; mesepisterna coarsely punctate with shiny interspaces ......................... 99
Malar spaces no more than one-third as long as broad; mesepisterna finely and shallowly punctate or rugosely punctate above .................................................. 100
99(98). Prothoracic spines long and needlelike, at least twice as long as width across the base; malar spaces seven-eighths as long as broad .............................................. texanus
Prothoracic spines short and sharp, roughly triangular; malar spaces one-half as long as broad .............................................. wickhami

100(98). Posterior basitarsi four and one-fourth times as long as broad; penis valves lacking dorsal wing (fig. 73); vertex finely and densely punctate .............................................. beamerorum
Posterior basitarsi three and one-quarter times as long as broad; penis valves with broad dorsal wing; vertex impunctate or very sparsely punctate ..............................................

101(100). Propodeum with lateral faces shiny, obscurely punctate; basal area of propodeum shallowly pitted, sloping sharply basally; first metasomal tergum with median line of disc shiny and impunctate; seventh ventral plates long and roughly quadrate with apical end narrowed and having long fringes of pile (fig. 66) .............................................. sphaeridium
Propodeum with lateral faces dull, weakly striate; basal area of propodeum with deep quadrate pits not sloping sharply ventrally; first metasomal tergum without shiny impunctate longitudinal mid-line; seventh ventral plates short, semi-lunar, with apices broadly rounded (fig. 65) .............................................. nigri

102(92). Metasomal terga with apical and basal fasciae absent (Malar spaces one-third as long as broad; propodeum with lateral and posterior faces dull and weakly roughened),

xerophilus cismontanus
Metasomal terga with fasciae broad and grey to white ..............................................

103(102). Tibiae and tarsi with strong admixture of black and fuscosus pile; seventh ventral plates square with apical margins weakly rounded, long pile over disc except on extreme median margins (fig. 61) .............................................. consors consors
Tibiae and tarsi with pile white or tawny; seventh ventral plates semilunar or elongately rectangular ..............................................

104(103). Metasomal terga three to six with discs having abundant erect black or fuscosus pile ..............................................
Metasomal terga three to six with discs having pile white or pale grey ..............................................

105(104). First metasomal tergum shiny impunctate, or sparsely and finely folliculated; seventh ventral plates small, roughly quadrate with apex broadly rounded, discs densely covered with long, laterally sloping pile (fig. 61) .............................................. consors mesocopus
First metasomal tergum shiny, distinctly punctate with punctures one to two puncture widths apart; seventh ventral plates diamond-shaped with median and lateral margins reflexed, sparsely covered with short erect pile (fig. 63) .............................................. nitescens

106(104). Mesoscutum and scutellum with admixture of black pile; mes-episterna very coarsely and densely punctate; punctures no more than one-half puncture width apart above, almost contiguous (Seventh ventral plates broad with large membranous apical expansion (fig. 68)) .............................................. swenki
Mesoscutum and scutellum with pile entirely light; mesepisterna with punctures variable, fine, not contiguous, separated by shiny interspaces

107(106). Flagellar segments as long as broad; first metasomal tergum and mesepisterna with discs distinctly punctate, punctures one-half puncture width apart on mesepisterna .... *nigrifrons*
Flagellar segments one and one-fourth times as long as broad; first metasomal tergum shiny, virtually impunctate except for shallow scattered punctures; mesepisterna with punctures about one puncture width apart on discs .... *xerophilus*

108(3). Malar spaces about one and one-eighth times as long as wide or shorter ........................................ 109
Malar spaces at least one and one-half times as long as wide .... 111

109(108). Antennae with flagellum light brownish yellow beneath; flagellar segments less than one and one-half times as long as broad (Clypeus closely punctate on basal portion with broad, shiny, impunctate areas on either side of mid-line; length 6.5-7.5 mm.; seventh ventral plates quadrate with apical margins sloping basally towards median edge (fig. 82)) ......... *prosopidis*
Antennae with flagellum dark brownish black or reddish brown beneath; flagellar segments more than one and one-half times as long as wide .................................................. 110

110(109). Mesepisterna with discs deeply punctate, punctures about one puncture width apart; metasomal terga black with reddish tinge, second and third metasomal terga with very broad apical fascial depressions; seventh ventral plates broadened apically and abruptly truncate with inner apical margins strongly reflexed (fig. 76); malar spaces broad, slightly longer than broad; clypeus long with broad, shiny, impunctate areas on either side of the mid-line ............ *algarobiae*
Mesepisterna with discs having punctures two puncture widths apart; seventh ventral plates broadened and rounded apically (fig. 83); malar spaces narrow, slightly shorter than broad; clypeus short and closely punctate across base, shiny areas on either side of mid-line with coarse, scattered punctures .................................................. *deserticola*

111(108). Seventh ventral plates with apical margins convex ........ 112
Seventh ventral plates with apical margins truncate or slightly concave (Far western and southwestern) ....................... 113

112(111). Mesepisterna with disc deeply punctate, punctures less than one puncture width apart; nervures of hind wing light, almost yellowish; seventh ventral plates shorter, apices more strongly convex (fig. 81); western part of Great Plains, *petalostemonis*
Mesepisterna with disc more finely punctate, punctures more than one puncture width apart; nervures of hind wing brown; seventh ventral plates longer, apices less strongly convex (fig. 79); southwestern deserts ............. *salicicola*
113(111). Malar spaces at least twice as long as broad; flagellar segments strongly tinged with yellow beneath; tarsi black (Flagellar segments about twice as long as wide; clypeus with deep median sulcus, densely and finely punctate; seventh ventral plates much as in algarobiae, slightly expanded apically and broadly rounded with long lateral and median fringes of hair (fig. 77); length 8.5-9.5 mm.) .......... clypeonitensis Malar spaces approximately one and one-half times as long as broad; flagellar segments strongly tinged with ferrugineous beneath; tarsi variable ........................................... 114

114(113). Flagellar segments approximately one and three-fourths times to twice as long as broad; metasomal terga black tinged with testaceous at apical fascial depressions; length 8-9 mm., 115 Flagellar segments approximately one and three-eighths times as long as broad; metasomal terga strongly tinged with blue to give discs bluish black lustre; length 7 mm. (Seventh ventral plates short with lateral fringes of pile as well as a long clump of pile arising at upper lateral face immediately beneath articulatory condyle (fig. 80)) .................. daleae

115(114). Seventh ventral plates long, expanded and slightly rounded at apex, about twice as long as wide (fig. 79); second metasomal tergum with disc deeply punctate, punctures about two puncture widths apart; length 8 mm. ......... salicicola Seventh ventral plates slightly expanded apically, apex truncate, about one and one-fourth times as long as wide (fig. 78); second metasomal tergum with disc smooth, shiny, and impunctate; length 8 mm. .................................. covilleae

**KEY TO THE FEMALES**

As in the males, further material is submitted to facilitate the separation of couplets 1, 2, and 3. Parallelisms in one or another of the key characters are exhibited by many species that are not members of the groups in question. The ensuing remarks are therefore provided.

Forms which should go to couplet 57 (americanus group) exhibit the following characters: malar spaces no more than one-half as long as broad; clypeus densely punctate, punctures striate to ovate; prothoracic spines short and sharp; flagellar segments about three-fourths as long as broad; propodeum with lateroposterior margins abrupt or ridged, not rounded; pile of body usually white to dusky to tinged with ochreus.

Forms which should go to couplet 76 (consors group) exhibit the following characters: malar spaces no longer than one-half as long as broad; clypeus variably punctate, punctures ovate to striate; flagellar segments short, about one-half as long as broad, sometimes slightly longer; propodeum with basal area narrow and sloping
sharply ventrally, lateral and posterior faces finely striate and roughened, lateroposterior margins rounded; pile of body long and dusky, often intermixed with black on head and thorax.

Forms which should go to couplet 95 (daleae group) exhibit the following characters: malar spaces no longer than three-fourths as long as broad; clypeus usually elongate with longitudinal median sulcus bordered by lateral, shiny, sparsely punctate rims; median sulcus densely punctate, rims sparsely punctate with round punctures; flagellar segments at least three-fourths as long as broad, usually much longer; propodeum with basal area smooth and broad, usually not sharply pitted but with a few weak longitudinal rugae, lateral and posterior faces shiny with numerous fine punctures, lateroposterior margins rounded; pile of body long and white; species small, less than 10 mm., and found only in western parts of the Great Plains and Lower Austral zone.

1. Metapleura each with dorsal prominence or horizontal carina usually with testaceous rim; malar spaces no longer than one-half as long as broad; last exposed sternum with apex not depressed .................................................. 57

Metapleura with no dorsal prominence, or, if weak prominence, with carina curving ventrally well in front of posterior margins; if having metapleural prominence then malar spaces as long as broad .................................................. 2

2(1). Median flagellar segments short, usually one-half to three-fourths as long as broad when viewed from above; and last exposed sternum with apical portion strongly depressed with basal arcuate band of overhanging pile; when apical depression very small, sterna with strong scopa .................................................. 76

Median flagellar segments usually as long as broad when viewed from above; last exposed sternum usually lacking depressed apical portion .................................................. 3

3(2). Clypeal punctures sparse and round, and clypeus with longitudinal median sulcus (sulcus not evident in some specimens of algarobiae); propodeum with basal area broad and not distinctly quadrate pitted .................................................. 95

Clypeal punctures elongate, at least apically, or, if not, clypeus lacking median sulcus; propodeum with basal area usually deeply pitted .................................................. 4

4(3). Mesoscutum and/or scutellum with admixture of black pile .................................................. 5

Mesoscutum and scutellum with no black pile .................................................. 34

5(4). Malar spaces at least three-fourths as long as broad .................................................. 6

Malar spaces usually one-half as long as broad or less .................................................. 10

6(5). Malar spaces one and three-eighths times as long as broad (Metasomal tergum one coarsely punctate; mesepisterna dull, finely roughened; length 11-13 mm.) .................................................. validus

Malar spaces no longer than broad .................................................. 7
7(6). First metasomal tergum coarsely and densely punctate, punctures no more than one puncture width apart (Propodeum with basal area very narrow, obscurely pitted) ... *skinneri*

First metasomal tergum shiny, impunctate or sparsely follicul- ... 8

8(7). Prothorax with dorsal lateral margins rounded, not spined; propodeum with dorsal and posterior faces dull and rough- ... *impunctatus lacustris*

Prothorax with short, sharp spines; propodeum with dorsal and posterior faces shiny and weakly pitted, lateroposterior mar- ... 9

9(8). Vertex with pile all light, occasionally a few dark hairs inter- ...  

Vertex with numerous dark hairs intermixed; metapleura with weak prominences above, prominences with narrow testaceous rims; tegulae light brown, ... *longifacies*

10(5). First metasomal tergum very finely punctate, punctures follicle- like and at least two puncture widths apart on discal area ... 11

First metasomal tergum deeply punctate, punctures one to one and one-half puncture widths apart laterally, or punctures fine and contiguous ... 21

11(10). Last metasomal sternum with elevated carinae curved mesad apically; first metasomal tergum with apical margin abrupt and rounded, fascia arising as apical fringe (Prothoracic spines short and sharp) ... *arizonensis*

Last metasomal sternum uniform; first metasomal tergum with apex flattened and fascial hairs arising subapically ... 12

12(11). Prothoracic spines short and obliquely truncate with anterior margins extending beyond posterior (Malar spaces one-fifth as long as broad) ... *rufocinctus*

Prothoracic spines pointed, not truncate ... 13

13(12). Mesoscutum and scutellum with pile long, dense, and erect, sparsely intermixed with dark hairs; mesepisterna with shiny interspaces above; procoxal spines short, about as long as broad ... *hyalinus*

Mesoscutum and scutellum with light pile restricted to peripheral portions, abundant black pile intermixed over discal areas; mesepisterna closely or contiguously punctate and roughened; procoxal spines variable ... 14

14(13). Second metasomal tergum with basal fascia ... 15

Second metasomal tergum without basal fascia ... 17

15(14). Procoxal spines absent; propodeum with basal area longitudi- nally striate, not quadrately pitted ... *perileucus*

Procoxal spines at least as long as wide; propodeum with basal area deeply quadrately pitted ... 16

16(15). Wings whitish hyaline; vertex with pile all light; second meta- somal tergum shiny, almost impunctate, laterally except for few follicles; clypeus striately punctate with broad shiny
interspaces becoming larger basally; mesepisterna coarsely and rugosely punctate above with no interspaces evident. *louisae*

Wings dusky hyaline; vertex with weak admixture of black pile; second metasomal tergum shiny, finely punctate with punctures about one and one-half puncture widths apart; clypeus closely, striately punctate to apex; mesepisterna densely and rugosely punctate but with evident interspaces on anterior faces .................................................. *fulgidus*

17(14). Malar spaces one-half as long as broad; mesepisterna coarsely, contiguously punctate (Length 11-13 mm.) ................. *carolinus*
Malar spaces no more than one-third as long as broad; mesepisterna coarsely punctate with shiny interspaces .................. 18

18(17). Metasomal sterna coarsely and sparsely punctate, punctures at least two puncture widths apart, sterna with sparse, short, erect pile and broadly interrupted apical fasciae .............. *perileucus*
Metasomal sterna dull, finely punctate, sterna lacking apical fasciae .......................................................... 19

19(18). Clypeus short, strongly convex, densely punctate to apex; sterna with dense scopae; compound eyes very large and broad; malar spaces linear .................................................. *titusensis*
Clypeus long, flattened or sulcate medially, sparsely punctate with shiny interspaces; malar spaces one-fourth to one-third as long as broad .................................................. 20

20(19). Clypeus with deep longitudinal median sulcus, extending from base to apex; prothoracic spines very short and sharp; malar spaces linear as long as broad .................................................. *intermixtus*
Clypeus not sulcate medially, but flattened; prothoracic spines at least as long as width across base; malar spaces one-fourth as long as broad .............. *chamaesarachae*

21(10). Last metasomal sternum with raised lateral longitudinal ridges extending to apex .................................................. 22
Last metasomal sternum simple, undifferentiated .................. 23

22(21). Prothoracic spines short and sharp; second metasomal tergum abruptly depressed basally; lateral ridges of last sternum weak and arcuate .................................................. *arizonensis*
Prothoracic spines vestigial; second metasomal tergum not depressed basally; lateral ridges of last sternum strong and straight .................................................. *compactus*

23(21). Posterior basitarsi twice as long as broad (Clypeus flattened, obscurely striately punctate; malar spaces one-third as long as broad) .................. *lattitarsis*
Posterior basitarsi at least three times as long as broad, usually longer .................................................. 24

24(23). Prothoracic spines long and sharp, longer than width across base of spine .................................................. 25
Prothoracic spines short, absent or obliquely truncate, never terminating in a needlelike point to edge of head .......... 29

25(24). Fore coxae with long spines, at least as long as broad .......... 26
Fore coxae lacking spines .................................................. 27
26(25). Scutellum striately punctate; prothoracic spines long and sharp, protruding to sides of head; first metasomal tergum closely punctate, punctures approximately one puncture width apart... *simulans*
Scutellum coarsely punctate, punctures not at all striate; prothoracic spines sharp, not protruding to sides of head; first metasomal tergum with punctures sparse and weak... *fulgidus*

27(25). Clypeus long, flat, dull, and roughened; flagellar segments short, about five-eighths as long as broad... *willistoni*
Clypeus short, convex, coarsely punctate with shiny interspaces; flagellar segments about as long as broad... 28

28(27). Malar spaces linear; propodeum strongly ridged on upper posterior face outside of triangle; apical fasciae narrow and weak, often absent medially... *nudus*
Malar spaces one-third as long as broad; propodeum with posterior face dull and roughened outside of triangle; apical fasciae broad, dense, and white... *gilensis*

29(24). Procoxal spines long, at least three times as long as broad... 30
Procoxal spines vestigial or absent... 31

30(29). Prothoracic spines obliquely truncate, with posterior margins extending beyond anterior; first metasomal tergum with abundant long erect ochreus pile... *angelicus*
Prothoracic spines short, blunt to truncate with anterior margins extending beyond posterior; first metasomal tergum with little discal pile except for short lateral fringes... *nufocinctus*

31(29). Antennae very short, flagellar segments one-half as long as broad; length 9-10 mm... 32
Antennae long, flagellar segments as long as broad; length 12-14 mm... 33

32(31). Metasomal terga one to three with distinct narrow preapical groove, followed by raised flangelike margins; clypeus closely punctate... *brevicornis*
Metasomal terga one to three with apical margins entire and smooth, broadly fasciate; clypeus flat, dull, and weakly roughened... *willistoni*

33(31). Mesepisterna dull, roughened, obscurely punctate; first metasomal tergum with punctures close and dense, no more than one puncture width apart; metasomal fasciae weak and tinged with ochreus... *inaequalis*
Mesepisterna shiny, deeply and coarsely punctate with punctures about one-half puncture width apart; first metasomal tergum finely punctate with punctures about one puncture width apart; metasomal terga tinged with metallic blue; metasomal fasciae broad, dense, and white... *cercidii*

34(4). Prothoracic spines sharp, at least as long as width across base... 35
Prothoracic spines short or absent, never as long as width across base... 47

35(34). First metasomal tergum shiny with few scattered fine punctures; terga never covered or partially obscured with compressed pubescence... 36
First metasomal tergum distinctly punctate, punctures about one and one-half puncture widths apart; terga often covered or partially obscured by appressed pubescence 39

36(35). Last metasomal sternum with weak, elevated lateral longitudinal carinae curved medially at apex; tegulae black; distinctus

Last metasomal sternum lacking carinae 37

37(36). Second metasomal tergum uniform, with very narrow, inconspicuous white basal fascia, most evident laterally; first metasomal tergum with a few weak folliclelike punctures, hyalinus

Second metasomal tergum weakly depressed basally with broad basal fascia; first metasomal tergum variably punctate, punctures usually coarse 38

38(37). First metasomal tergum with apical fascial margin not depressed medially; metasomal terga five and six with pile of discs light ochreus to golden; first metasomal tergum shiny, a few coarse punctures scattered over surface; birkmanni

First metasomal tergum with apical fascial margin abruptly depressed throughout its breadth; metasomal terga five and six with pile of discs deep fuscosus to black; first metasomal tergum with punctures concentrated on median discal area; slevini

39(35). Malar spaces linear; body very coarsely, contiguously punctate; metasomal terga one and two with punctures as coarse as those on mesoscutum; robertsonii and timberlakei

Malar spaces one-third as long as broad; body variably punctate; metasomal terga one and two with punctures much finer than those of mesoscutum 40

40(39). Metasomal tergum three without basal fascia; metasomal terga four and five with discs having deep fuscosus to black pile; scutellum coarsely punctate over posterior three-fourths, weakly striate on anterior half 41

Metasomal tergum three with basal fascia; metasomal terga four and five with discs having tawny to ochreus pile; scutellum shiny, sparsely punctate 46

41(40). Second metasomal tergum with deep basal depression and weak white fascia, depression deepest medially; malar spaces about one-half as long as broad 42

Second metasomal tergum shallowly or not depressed basally with weak white fascia; malar spaces less than one-half as long as broad 43

42(41). First metasomal tergum with apex abruptly depressed, disc shiny, finely and sparsely punctate with punctures two to four puncture widths apart; slevini

First metasomal tergum not strongly depressed apically, disc densely and coarsely punctate to apex, with punctures one puncture width apart; wootoni
43(41). Scutellum with anterior half weakly, longitudinally striate or punctate to edge; first metasomal tergum finely punctate with punctures one to two puncture widths apart, *hyalinus gaudialis*

Scutellum with anterior one-third nonpunctate, nonstriate; first metasomal tergum with punctures uniformly dense, no more than one puncture width apart

44(43). Length 8-9 mm.; metasomal terga one and two punctate with interspaces dull; montane species from southern California, *lutzi pinorum*

Length 10-12 mm.; metasomal terga one and two punctate with shiny interspaces

45(44). Sternal discs rather dull, with a few fine punctures; mesepisterna with punctures separated, about one puncture width apart; northern and western species *kincaidii*

Sternal discs shiny and usually coarsely punctate, punctures about one and one-half puncture widths apart; mesepisterna with punctures closer and almost contiguous on upper half; southern half of United States *eulophi*

46(40). Length 9 mm.; clypeus with sparse, coarse longitudinal punctures to apex; second metasomal tergum densely punctate with punctures about as coarse as those of tergum one; antennal segments as long as broad *phacelae*

Length 7 mm.; clypeus with apical one-half shiny impunctate laterally; second metasomal tergum finely folliculated, dull; antennal segments two-thirds as long as broad *lutzi*

47(34). Eyes with inner orbital margins nearly parallel; mesepisterna dull, shallowly, obscurely punctate

Eyes with inner orbital margins strongly convergent below; mesepisterna shiny to variable

48(47). Posterior basitarsi three and one-half times as long as broad; mesoscutum with pile ochreus; length 13 mm.; western part of Great Plains *andrewsi*

Posterior basitarsi four and one-fourth times as long as broad; mesoscutum with pile tawny; length 11 mm.; eastern seaboard *astivalis*

49(45). Metapleura strongly protuberant above, protuberances with narrow black rims; malar spaces as long as broad *productus*

Metapleura not protuberant above; malar spaces less than three-fourths as long as broad

50(49). Mesepisterna dull, obscurely or finely and densely punctate; mesoscutum with pile bright ochreus

Mesepisterna rugosely punctate with shiny, although sometimes roughened, interspaces; pile variable in color

51(50). First metasomal tergum finely and densely punctate, punctures one-half puncture width apart; tergal fasciae complete and white; length 11 mm. *ciliatus*

First metasomal tergum shiny impunctate to sparsely folliculated; tergal fasciae absent or evident only as lateral fringes; length 14-15 mm. *thoracicus*
52(50). Apical metasomal sternum with posterior half sharply depressed, apex hyaline nonplumose with long pile overhanging depressed area

Apical metasomal sternum simple, not longitudinally differentiated or with weak lateral longitudinal ridges

53(52). Malar spaces linear; metasomal terga two and three with no evident basal fasciae; nervures and stigma dark brown to black

Malar spaces half as long as broad; metasomal terga two and three with weak basal fasciae; nervures and stigma brown, turciventris

larreae

54(52). First metasomal tergum coarsely and densely punctate, punctures no more than one puncture width apart

First metasomal tergum shiny, sparsely punctate or finely folliculated

55(54). Metasomal tergum two deeply depressed basally throughout; malar spaces one-half as long as broad; posterior tibiae with pile light

Metasomal tergum two shallowly depressed basally, depression not evident medially; malar spaces one-third as long as broad; posterior tibiae with admixture of black pile, wootoni

bryanti

56(54). Last metasomal sternum with weak, elevated lateral longitudinal carinae curved medially at apex; second metasomal tergum finely and densely folliculated; tegulae black, distinctus

Last metasomal sternum lacking carinae; second metasomal tergum sparsely folliculated; tegulae brown hyaline, brimleyi

57(1). Mesoscutum covered with short, dense, plumose pubescence giving the surface a mosslike mat appearance

Mesoscutum covered with moderately long pile, not dense and crowded to conceal surface

58(57). Anterior edge of pronotum raised and protruding as an erect plate, most evident as an abruptly protruding plate above the coxal bases; pronotum very broad; metapleural prominence with broad testaceous rim

Anterior edge of pronotum not protruding as an erect plate above the coxal bases; metapleural prominence with narrow testaceous or dark brown rim

59(58). Metasomal terga one to five covered with short, dense, appressed pubescence concealing the surface; legs yellow to light brown-yellow apically from trochanters; western part of Great Plains

Metasomal terga one to five not completely covered with appressed pubescence, a narrow prefascial area on each disc free from pile; legs reddish brown, tending to darker brown basally; metapleural prominence weakly protuberant with a narrow dark brown rim; known only from North Carolina

wilmattae

howardi

60(57). Wings whitish hyaline, bare or covered with short white pubescence

Wings dusky hyaline, covered with short, deep ochreus to dusky pubescence
61(60). First metasomal tergum with disc finely and closely punctate, punctures shallow and about one puncture width apart on lateral faces; metasomal terga with short, sparse, appressed pubescence over surface .................. susannae
First metasomal tergum shiny impunctate or finely folliculated laterally with follicles at least two follicle widths apart; metasomal terga with at most the basal half covered with appressed pubescence .................................................. 62

62(61). Malar spaces one-half as long as wide; mesepisterna and mesoscutum with discs deeply and coarsely punctate, punctures no more than one puncture width apart ........ albecens
Malar spaces one-fourth as long as wide or less; mesepisterna and mesoscutum with discs obscurely punctate .................. 63

63(62). Metasomal terga one to four covered with short, dense, appressed pubescence, completely concealing the surface, tectiventris
Metasomal terga one to four with discs bare except for basal fascia of second metasomal tergum .................. micheneri

64(60). Metasomal terga one to four covered with short, appressed pubescence completely concealing the surface ..... 65
Metasomal terga with discs bare, or partially covered with semierect pile not concealing the surface .................. 67

65(64). Mesepisterna shiny and distinctly punctate, punctures at least one puncture width apart; mesoscutum sparsely, shallowly punctate; metasomal terga with pubescence sparse but complete and appressed (Pile of head and thorax yellow), solidaginis
Mesepisterna dull, coarsely punctate with punctures almost contiguous; mesoscutum with punctures coarse, about one puncture width apart; metasomal terga with pubescence dense over entire surface .................................................. 66

66(65). Pile of head and thorax ochreous; wings dusky hyaline with abundant ochreous pubescence over surface; metapleural prominence with rim variable but usually narrow and testaceous; length 9-10 mm. .................. ochraceus
Pile of head and thorax pale ochreous to dusky grey; wings with sparse, light ochreous pubescence; nervures light yellow-brown; metapleural prominence with rim narrow, black to deep brown; length 8-9 mm. .................. tectiventris

67(64). Metapleural prominence strongly protuberant with a broad rim, abruptly declivous beneath .................. 68
Metapleural prominence weakly protuberant with narrow brown to black rim, shallowly concave beneath .................. 71

68(67). Tegulae black; fascial foveae with upper margins curved strongly mesad, extending two-thirds of the way to lateral ocelli from eyes; mesoscutum with pile dusky grey .... sartensis
Tegulae brownish hyaline; fascial foveae with upper margins rounded (not curved) mesad, extending less than half way to lateral ocelli from eyes; mesoscutum with pile tinged with ochreus .................. 69
69(68). Second metasomal tergum with broad, dense basal fascia, at least as broad as nonpubescent area between basal and apical fasciae; first metasomal tergum finely and densely punctate especially laterally; metasomal terga three to five with short, white, semierect pile, giving the surface a whitish sheen; apical fasciae broad and white; lateral fringes of first metasomal tergum dense and continuous to apical fascia; mesoscutum with pile white to ochreus mandibularis. Second metasomal tergum with basal fascia weak or absent, not more than one-third as wide as nonpubescent area between basal and apical fasciae; first metasomal tergum with disc sparsely folliculated and shiny; metasomal terga three to five bare and shiny, occasionally with a few semierect hairs; apical fasciae weak and narrow; first metasomal tergum with lateral fringes weak and usually not continuous to apical fascia; mesoscutum with pile deep ochreus to yellow, 70

70(69). Second metasomal tergum with no basal fascia; mesepisterna coarsely and shallowly punctate with shiny interspaces; propodeum with posterior face traversed by numerous rugae; pile of body sparse, pale grey bradleyi. Second metasomal tergum with a narrow basal fascia; mesepisterna densely, almost contiguous, punctate; propodeum with posterior face smooth, sparsely punctate; pile of body tinged with fuscous americanus. Mesoscutum and scutellum with strong admixture of black and dark hairs; second metasomal tergum with no basal fascia; mesepisterna rugose thysanellae. Mesoscutum and scutellum with pile entirely light; second metasomal tergum with strong basal fascia; mesepisterna distinctly punctate. 72

71(67). Anterior coxae with spines rudimentary; posterior basitarsi about three and one-fourth times as long as broad, laticinctus. Anterior coxae with spines well developed; posterior basitarsi four to five times as long as broad. 73

72(71). Posterior basitarsi five and one-fourth times as long as broad; mesepisterna densely and continguously punctate, with a dense covering of long, fine, tawny to white pile; length 12 mm. gypsicolens. Posterior basitarsi four times as long as broad; mesepisterna with punctures separated by shiny interspaces below; pile short and not obscuring surface, usually tinged with yellow, 74

73(72). Second and third metasomal terga with distinct basal fasciae; wings with nervures light yellow-brown; antennae tinged with yellow annae annae. Second metasomal tergum with weak basal fascia, fascia absent on third; wings with nervures deep brown; antennae dark brown. 75

74(73). Mesepisterna with upper half finely, densely, continguously punctate, almost roughened; mesoscutum and scutellum with pile tinged with deep ochreus; America east of Continental Divide mitchelli.
Mesepisterna sharply punctate, punctures separated by broad shiny interspaces; mesoscutum and scutellum with pile tawny to tinged with yellow; southern California and extreme southwestern United States

76(2). Inner orbital margins, mesepisterna, and upper genal areas with pile black or with admixture of black pile

77 Inner orbital margins, mesepisterna, and upper genal areas with pile white or pale grey

77(76). Pile of mesepisterna black

80 Pile of mesepisterna, especially upper half, white to tawny grey (Face with abundant white pile above antennal bases)

78(77). Metasomal terga with apical fasciae absent; vertex with pile light to dusky; southern California, xerophilus cismonatus

79 Metasomal terga with apical fasciae present; vertex with pile variable

79(78). Mesoscutum and scutellum with pile all light; pile of face, vertex, and genal areas predominantly black, paniscus paniscus

80(77). Prothoracic spine long and distinct, at least one and one-half times as long as width across the base (Pile of head, thoracic pleura, and legs black; metasomal fasciae absent) californicus

80(77). Prothoracic spine absent or vestigial

81(80). Mesoscutum and scutellum with strong covering of pale grey to light ochreus pile

82(81). Metasomal terga two to five with apical fasciae very weak but discernible at lateral margins; mesoscutum and scutellum with pile white to pale grey; propodeum with pile white, consors consors

82(81). Metasomal terga two to five with no apical fasciae; mesoscutum and scutellum with pile light ochreus; propodeum with strong admixture of black pile consors pascoensis

83(81). Metasomal terga one to five with dense white apical fasciae at least laterally; malar spaces one-third as long as wide; metasomal terga one and two finely punctate, punctures one to two puncture widths apart nigrifrons

84(83). Metanotum and mesoscutum with strong admixture of black pile medially, paniscus mertensiae

84 Metanotum and mesoscutum with few scattered black hairs, paniscus sculleni

85(76). First metasomal tergum densely punctate or folliculated with punctures one to two puncture widths apart

86 First metasomal tergum impunctate or finely and sparsely folliculated
86(85). Metasomal terga one and two with distinct narrow preapical grooves followed by raised flangelike margins (Metasomal terga coarsely and densely punctate) .......... brevicornis
Metasomal terga one and two with apical margins smooth .......... 87
87(86). Clypeus long, flattened medially with a very faint longitudinal median sulcus; prothoracic spines long, needlelike, about one and one-half times as long as width across the base, texanus texanus
Clypeus short, uniformly convex, shiny; prothoracic spines short, triangular .......... 88
88(87). Large robust species, 14 mm.; metasomal terga one to three coarsely and densely punctate, apical fasciae in sharply declivous, nonpunctate depressions. robertsonii and timberlakei Smaller species, 7-8 mm.; metasomal tergum one more densely punctate than two or three, apical fasciae not in marked depressions .......... linsleyi
89(85). Last metasomal sternum with the apical one fourth or less depressed; body with pile short and white with few black hairs intermixed; fascial foveae strongly depressed above .......... 90
Last metasomal sternum with apical one half strongly depressed; body with pile long, sparse, and dusky; fascial foveae weakly depressed above .......... 92
90(89). Mesoscutum and scutellum with discs having strong admixture of black pile, at least one half of pile black .......... scwenki
Mesoscutum and scutellum with pile light, a few dusky hairs intermixed (Clypeus short, convex, shiny, very sparsely, coarsely punctate) .......... 91
91(90). Fascial foveae broad above, extending over half way from eyes to lateral ocelli; some short black pile over mesoscutum, scopiventer
Fascial foveae narrow above, extending about one third of way from eyes to lateral ocelli; black pile restricted to few hairs on scutellum .......... aridus
92(89). Metapleura with a few dark hairs on upper faces; head very broad, about one and one-third times as broad as long (Metasomal terga two and three finely and densely punctate or coarsely folliculated with shiny interspaces; California) .......... nitescens
Metapleura with pile white; head about one and one-fifth times as broad as long or less .......... 93
93(92). Clypeus coarsely, contiguously, striately punctate to apex; mesepisterna coarsely and densely punctate above, punctures one-half puncture width apart; fascial foveae obscure, median margins not discernible, dorsal margins extending barely above upper inner orbital margins; tegulae black; California .......... sphaeralceae
Clypeus irregularly punctate with shallow, obscure punctures, weakly rugose and shiny; mesepisterna shallowly punctate with shiny interspaces; fascial foveae variable .......... 94
94(93). Fascial foveae very broad and deep; dorsal edge extending at least two thirds of the way to the lateral ocelli; metasomal terga two and three shiny, impunctate; tegulae brownish hyaline; America east of Continental Divide. consors mesocosopus
Fascial foveae obscure, narrow, not extending above upper inner orbital margins; metasomal terga two and three finely folliculated and shiny; tegulae deep brown to black; montane species, Rocky Mountains. paniscus paniscus

95(3). Metasomal terga nearly or completely covered with short, appressed pubescence, most nearly complete on metasomal terga three to five
Metasomal terga having discs nonpubescent, except for basal fasciae sometimes present on terga two and three

96(95). Malar spaces long, at least as long as broad; posterior basitarsi four times as long as broad
Malar spaces three-fourths as long as broad; posterior basitarsi broad, three and one-fourth times as long as broad (Pile of vertex, mesoscutum, scutellum and apical metasomal terga strongly tinged with ochreus). coevilleae

97(96). Pile of vertex and mesoscutum long and deep ochreus; mesepisterna dull above with punctures shallow and obscure; prothoracic spines absent; nervures deep brown to black; length 10-11 mm. 
ypeonitens
Pile of vertex and mesoscutum short and pure white; mesepisterna shiny with deep punctures separated by shiny interspaces; prothoracic spines short and sharp; nervures light yellow-brown, especially basally; length 8-9 mm. petalostemonis

98(95). Mesepisterna with punctures shallow and sparsely scattered over shiny black surface, punctures two to four puncture widths apart on disc; malar spaces one-half as long as broad or less
Mesepisterna with punctures deep and close, no more than one puncture width apart on disc; malar spaces three-fourths to seven-eighths as long as broad (shorter in desertica Timb.)

99(98). Antennae with under surface of flagellum light brownish yellow; mesepisterna with punctures almost obscure, at least four puncture widths apart on discs; metasomal terga five and six with disc having abundant golden erect pile; length 8 mm. prosopidis
Antennae with under surface of flagellum reddish brown; mesepisterna with punctures distinct but at least two puncture widths apart on disc; metasomal terga five and six with disc having abundant, deep ferrugineous to black, erect pile; length 9-9.5 mm. algarobiae

100(98). Metasomal terga six (and sometimes five) with disc having abundant, deep ferrugineous to black hairs; prothoracic spines at least as long as broad at base
Revision of the Bee Genus Colletes

Metasomal terga five and six having disc covered with light hairs; prothoracic spines vestigial or absent. \textit{salicicola} 101 (100). Malar spaces about seven-eighths as long as broad; metasomal terga two and three with weak basal fasciae; apical fasciae loose and broad; length 8.5-9 mm. \textit{daleae}

Malar spaces slightly less than three-fourths as long as broad; metasomal terga two and three with broad, dense basal fasciae; apical fasciae dense and broad; length 9.5-10 mm., \textit{deserticola}

DESCRIPTIONS OF THE SPECIES

Group I—\textit{productus}

Colletes \textit{productus} Robertson

(Fig. 1)


Although this species resembles the \textit{americanus} group, a multitude of characters clearly indicate that it does not belong there, and both sexes are easily distinguished from that group by their exceptionally long malar spaces, which are at least one and one-half times as long as wide in the males and as long as wide in the females. The great morphological differences in other characters indicate that the rimmed metapleural protuberances, which are common to the \textit{americanus} group, may have been independently developed in \textit{productus}.

Male: length 9-11 mm., wing length 6 mm.

Pile of body very sparse, ochreus to pale grey; pile of face clumped principally about antennal bases and extending below to basal portion of clypeus; malar spaces and lower half of clypeus relatively free of hair and shiny; hair of vertex pale grey and sparse; lower genal areas with hairs sparse, long, and plumose; mesoscutum with pile sparse, ochreus to tawny yellow; scutellum with weak lateral and posterior fringe of pale grey pile; mesoscutum with ochreus pile extending down to posterior lobe of pronotum having a few darker hairs among pale hairs on upper mesopleura; hair of mesepisterna very sparse, long, and branched, never sufficiently dense to conceal surface; upper lateral edges of propodeum with a dense clump of pale grey hairs, lateral and posterior faces of propodeum free of pile; legs with short, pale grey pubescence even on posterior femora; first metasomal tergum with few sparse hairs
not concealing surface to any extent, but with weak lateral fringes of greyish pile; metasomal tergal fasciae narrow and weak, easily removed by rubbing; fasciae present on first to fifth metasomal terga; discs of metasomal terga three to six with abundant, short, erect, ferrugineous to blackish pile; sternal fasciae composed of a few, sparse, apical, ochreus hairs.

Antennae long, flagellar segments about one and one-half times as long as wide; malar spaces at least one and one-half times as long as wide; clypeus long, densely punctate basally, punctures becoming sparser towards apex, lateroapical half shiny with very few punctures, clypeus flattened slightly medially with a weak furrow evident at base; elongate malar spaces and clypeus forming a knob-like extension to head; vertex shiny with few punctures. Prothoracic spines very short and sharp; anterior and posterior edges of pronotum raised with shallowly concave disc, most evident at lateral edge; mesoscutum black and shiny with very sparse, shallow punctures, punctures approximately three puncture widths apart even at anterior extremity of mesoscutum, mesoscutum with small impruncate area; scutellum with punctures coarse and dense on posterior half; mesepisterna shiny with obscure, shallow punctures on lower half, punctures becoming more distinct and much denser towards upper anterior face; metapleural prominences distinct but not reaching posterior margins of metapleura, rims dark brown, most conspicuous on anterior half; propodeum with lateral faces shiny, traversed by sharp rugae, lateroposterior edge abrupt, not rounded, with a weak ridge separating the two surfaces, basal area of propodeum with shallow, quadrate pits; tegulae dark brown hyaline; wings dusky hyaline with scattered, fine, ochreus pubescence most noticeable apically, nervures dark brown; legs black at bases, more brownish apically; hind basitsarsi three times as long as wide. Disc of first metasomal tergum virtually impruncate, shiny; discs of terga two to four, shiny, and weakly folliculated.

Female: length 10-11 mm., wing length 6-7 mm.

Body black with a weak covering of hair on head and thorax, abdomen sparsely pubescent; hair of face sparse, concentrated chiefly about antennal bases, vertex with a very few, pale grey hairs; pile of upper genal areas dense white to pale grey, becoming sparser and longer towards ventral faces; hair of mesoscutum ochreus and very sparse, not concealing surface; scutellum with a dense rim of pale ochreus pile on lateral and posterior edges; posterior lobes of pronotum with a dense mat of whitish to grey hair;
mesepisterna with sparse, elongate, branched pubescence, not concealing surface; upper lateral surfaces of propodeum with dense clumps of ochreous hair; first metasomal tergum with but a few, long, pale grey hairs on anterior face, very weak lateral fringes of hair on first tergum, which do not reach to fascia, fascia white and sharply narrowed medially; metasomal terga two to five with fasciae not narrowed as on first tergum, a slight widening of fasciae laterally followed by an abrupt narrowing at extreme lateral margins; pile of legs short, moderately dense except on posterior femora, where pile is long, curled, and pale grey; sternal fasciae absent; discs of metasomal terga three to six with short, dark ferrugineous to black pubescence giving surface an ironish tinge.

Antennae short and dark, basal flagellar segment about as long as second; malar spaces at least as long as wide; clypeus shiny and sparsely punctate with large punctures over basal three-fourths, becoming shiny impunctate on apicolateral portions, a weak longitudinal median furrow most pronounced half way between base and apex; vertex shiny impunctate; fascial foveae deep, shiny impunctate. Prothoracic spines short and blunt; pronotum expanded slightly laterally as a convex structure; mesoscutum with shallow, sparse punctures over surface, punctures at least three puncture widths apart, even on extreme anterior surface of mesoscutum, impunctate area large and shiny; scutellum with deep, dense punctures over posterior half; mesepisterna with punctures shallow and obscure below, becoming deeper and denser towards the upper anterior portions, punctures on upper mesepisterna not more than one puncture width apart whereas those on posterior edges shallow and obscure; metapleural prominences strongly protuberant with dark brown rims, only slightly concave beneath; lateral faces of propodeum dull with a few, weak rugae near lateroposterior margins, basal area with distinct, quadrate pits; tegulae dark brown; wings dusky hyaline with weak, ochreus pubescence on surface; legs dark brown to black at bases, tibiae and tarsi much more reddish brown; posterior basitarsi wide and shallowly concave on upper surfaces, about two and three-quarters times as long as wide. First metasomal tergum weakly and sparsely punctate, punctures on lateral portion of disc about two puncture widths apart, becoming shallower and sparser on anterior and mid portions of disc; second and third metasomal terga with very weak, dense, follicle-like punctures giving them a roughened yet shiny appearance.

**Distribution:** Georgia: Margaret; Helen; Sarah. Alabama: Mobile; Kushla. North Carolina: Bryson City; Grandfather Mountain;

Flight records: May 10 to July 26.

Plant records: Rhus glabra; Xolisma ligustrina.

The holotype, apparently from Carlinville, Illinois, is in the collection of the Illinois Natural History Survey.

Through the courtesy of L. K. Gloyd of the Illinois Natural History Survey, I have received the following information on the type of this species:

“In the Trans. Am. Ent. Soc. for 1891, vol. 18, on p. 49, Mr. Robertson wrote ‘I submit a synopsis of all the species which occur in my neighborhood (Carlinville, Ill.) with notes on their time of flight and the flowers which they visit, as well as descriptions of new species’. So neither of the specimens from New Hampshire and Massachusetts at the University of Nebraska can be the holotype. Apparently Robertson placed the sign ♂ or ♀ immediately following the species name at the beginning of his descriptions to indicate upon which sex the description was based. In the case of *productus*, a ‘♀’ follows the name but the last paragraph reads, ‘One male, taken July 21st on flowers of *Apocynum cannabinum*.’ In the paper by Martin H. Muma, Bull. Univ. Nebr. State Mus., vol. 3, No. 8, 1952, the type of *Colletes productus* is listed as a ♀. So I think the ♂ specimen here must surely be the holotype.”

*Colletes arizonensis* sp. nov.

(Fig. 2)

This new species from the mountains of Arizona resembles *peri-leucus* rather closely. The males have dark pile on the vertex, mesoscutum, and scutellum, and have the first metasomal tergum closely punctate. The females are rather distinctive in having lateroapical elevated ridges on the apical ventral metasomal segment and abundant black pile on the thorax and head. An unusual character of both sexes is that the apical margin of the first metasomal tergum is bluntly rounded rather than with a broadly flattened fascial depression as on each of the remaining metasomal terga. The fascia of the basal tergum is composed of short, white pile at the extreme apex.

Male: length 8.25 mm., wing length 7 mm.

Pile of face long and white, sparse over clypeus, partially concealing surface, a few dark hairs below antennal bases; vertex with
pile predominantly black, with a few pale gray to ochreus hairs inter-
mixed; upper genal areas with pile short, pale grey, a few darker
hairs intermixed on anterior face, pile becoming much longer, denser,
and whiter below; mesoscutum with a sparse covering of pale grey
and black pile, becoming more predominant on median discal area;
scutellum with a very narrow peripheral fringe of fine, pale grey pile,
abundant, long, black pile over mediolateral areas; mesepisterna
with pile long, white to pale grey, and fine; propodeum with tufts of
long pile at upper lateroposterior margins, pile with a strong ad-
mixture of black hairs, lateral and posterior faces with long, fine,
pale grey, erect pile; first metasomal tergum with an apical fringe
of short, white pubescence, not lying in a depressed fascia, lateral
fringes of white pile short, reaching apical fascia, disc with abundant,
short, erect, whitish pile, not at all concealing surface; metasomal
terga two to five with fasciae narrow, weak, and white; metasomal
terga four to six with abundant, erect, short, black pile on discs;
metasomal sternae two to five with weak apical fringes of white to
pale grey pile.

Antennae deep reddish brown to black, flagellar segments one
and one-half times as long as broad; malar spaces one-half as long
as broad; clypeus weakly convex with a shallow, longitudinal me-
dian sulcus, surface weakly, striately punctate, punctures most dense
along clypeofrontal regions and down median sulcus, punctures of
lateral faces striate and separated by shiny interspaces; vertex
shiny, impunctate. Prothoracic spines short and sharp, about as
long as width across base; mesoscutum coarsely punctate over an-
terior one-half and lateral margins, impunctate area large; scutellum
with a few coarse punctures about lateral and posterior margins,
median discal area very sparsely punctate with broad, shiny inters-
spaces, anterior one-half virtually impunctate; mesepisterna deeply
punctate with shiny interspaces, punctures one-half puncture width
apart; propodeum with basal area very shallowly, quadrately pitted,
lateral and posterior faces shiny and rather sharply punctate; tegulae
black; wings dusky with abundant, very short, fine, deep fulvous
pubescence, nervures deep brown; legs deep brown to black; pos-
terior basitarsi four times as long as broad. First metasomal tergum
densely punctate on lateral and apical margins, punctures fine and
no more than one puncture width apart, punctures becoming very
sparse and much finer on median and medioapical faces where
they are four to five puncture widths apart, apical margin not de-
pressed to retain fascia, rather abruptly rounded with a very weak
preapical groove; second metasomal tergum densely, coarsely folliculated, follicles about one follicle width apart; metasomal sterna shiny; seventh ventral plates much as in productus, however with laterobasal projection blunt and weakly rounded (fig. 2).

**Female:** length 10 mm., wing length 7.75 mm.

Pile of face rather sparse, concentrated chiefly about antennal bases and along lower inner orbital margins, a few darker hairs intermixed below antennal bases; vertex with pile predominantly black, a few pale grey to dusky hairs intermixed; upper genal areas with pile short and pale grey, with a few longer, black hairs intermixed, pile becoming longer, whiter, and finer below; mesoscutum with a sparse covering of pale grey and black pile, black pile predominating on median discal area; scutellum with a narrow lateral and posterior fringe of white pile, having abundant, erect, black pile medially; mesepisterna with an admixture of pale grey and black pile on preepisterna and on upper mesepisterna, pile becoming longer and pure white below; propodeum with long tufts of intermixed black and pale grey pile on dorsal surface of lateroposterior margin, lateral and posterior faces with abundant, erect, pale grey pile; femora and tibiae of middle and hind pairs of legs with pile long and tinged with fulvous; abundant, short, black pile intermixed particularly on upper surfaces of tibiae; first metasomal tergum with a dense apical fringe of short, white pubescence, lateral fringes very weak and white, barely reaching fascia, disc with abundant, erect, whitish pile; metasomal terga two to four with fasciae narrow, white, and weak; metasomal terga three to five with abundant, erect, deep fulvous to black pubescence; metasomal sterna with sparse, erect, pale grey pile, particularly on apical one-third of each sternum.

Antennae brown below, black above, long, flagellar segments about as long as wide; malar spaces three-eighths as long as wide; clypeus flattened with a deep longitudinal median sulcus, clypeus sparsely, coarsely, striately punctate, punctures one to three puncture widths apart, with broad, shiny interspaces; vertex shiny, impunctate; fascial foveae very deep, broadened slightly medially, extending above inner orbital margins, reaching almost half way from inner orbital margins to lateral ocelli. Prothoracic spines short and sharp, about as long as width across the base; mesoscutum coarsely and densely punctate about anterior one half and lateral margins, impunctate area small; scutellum finely, almost contiguously punctate, about extreme lateral and posterior faces, punctures becoming sparse
in median discal area and absent on anterior one-third; mesepisterna densely and coarsely punctate, punctures no more than one-half puncture width apart with shiny, linear interspaces; propodeum with basal area very shallowly, quadrately pitted, lateral and posterior faces with numerous, sharp punctures, surface moderately shiny; tegulae deep brown to black; wings dusky, very densely covered with deep fulvous pubescence, nervures deep brown; legs deep brown to black; posterior basitarsi three and three-fourths times as long as broad. First metasomal tergum very finely punctate about lateral and apical margins, punctures becoming exceedingly fine and sparse on median and medioapical surfaces where they appear to be folliculated rather than punctured; second metasomal tergum densely and finely folliculated; metasomal sternum dull, densely folliculated, last metasomal sternum with weak, elevated, lateral ridges, extending about apicolateral margins to posterior margin cutting off a narrow, shiny apical rim.

**Distribution:** Holotype, male, south slope Tumacacori Mountain, 8 miles west of Nogales, Arizona, 6000 feet, in the chaparral zone, July 20, 1949 (F. Werner and W. Nutting); allotype, female, top of Huachuca Mountains, Arizona, August 10, 1940 (E. S. Ross); paratypes: 2 males, south slope of Tumacacori Mountain, 8 miles west of Nogales, Arizona, 6000 feet, chaparral zone, July 20, 1949 (F. Werner and W. Nutting); 1 female, top of Huachuca Mountains, Arizona, August 10, 1940 (E. S. Ross).

The holotype is in the collection of the Musuem of Comparative Zoology at Harvard University and the allotype is in the collection of the California Academy of Sciences.

**Colletes perileucus** Cockerell

(Fig. 5)


The species, originally described from a female from Guaymas, Sonora, Mexico, has been recorded from California by Timberlake. The present work extends the range to Arizona and southwestern Texas. It is difficult to separate the females of *perileucus* and *albocinctus*; however, *perileucus* has the prothoracic spines very long and sharp, and the second metasomal tergum not depressed basally. There is some doubt as to the correct association of the sexes of *albocinctus* and it is not at all impossible that the female designated as *albocinctus* may prove to be a subspecies of *perileucus*. The males of the two species are markedly different, *perileucus* having
the malar spaces one-half as long as wide and the first metasomal tergum shiny and impunctate, whereas in *albocinctus* the malar spaces are slightly longer than wide and the first metasomal tergum is densely, coarsely punctate. The males of *perileucus* are distinguished from *arizonensis* by having the black pile only on the scutellum and in having the first tergum shiny and impunctate. The females are readily distinguished from closely related species by having black pile restricted to the vertex, mesoscutum, and scutellum, and also by the impunctate condition of the first metasomal tergum.

**Male:** length 10 mm., wing length 7.5 mm.

Pile of face long, dense, and pure white, completely concealing clypeus and lower face; vertex with pile long and pale grey; upper genal areas with pile long, dense, and pale grey, becoming much whiter and finer below; mesoscutum with pile long, dense, and dusky; scutellum with a dense covering of long pile, particularly about lateral and posterior margins, pile dusky on extreme peripheral edge, strongly admixed with black medialy; mesepisterna with pile long, fine, and white; propodeum with dense fringes of white pile on lateroposterior margins from dorsal face to pedicel, lateral and posterior faces with abundant, very long, white pile; pile of legs sparse, short, and white; first metasomal tergum with a dense, broad, white apical fascia, lateral fringes of long, white pile extending to apical fascia, disc with abundant, long, erect, white to pale grey pile, partially obscuring the surface medially; metasomal terga two to five with fasciae narrow but pure white; metasomal terga four to six with abundant, erect, deep fulvous to black pubescence, not at all concealing surface; metasomal sterna two to five with dense apical fringes of white pile.

Antennae long and brown, flagellar segments one and one-half times as long as broad; malar spaces five-eighths as long as broad; clypeus weakly convex, rather densely and finely punctate, particularly on clypeofrontal margins and down median longitudinal line, punctures coarser on apicolateral faces and tending to be somewhat striate; vertex dull, densely and deeply punctate. Prothoracic spines long and sharp, at least one and one-half times as long as width across base; mesoscutum densely punctate over anterior and lateral margins, punctures becoming sparse medially, impunctate area large; scutellum coarsely punctate over posterior one half, punctures becoming finer anteriorly to absent on extreme anterior face, punctures not at all striate; mesepisterna with punctures shal-
low, coarse, one-half puncture width apart above to one puncture width apart below, interspaces shiny; propodeum with basal area not at all pitted, weakly roughened, lateral and posterior faces dull and weakly roughened; tegulae brownish hyaline; wings very weakly dusky with very sparse, deep fulvous pubescence apically, nervures brown; legs deep brown to black; posterior basitarsi four times as long as broad. First metasomal tergum shiny, sparsely folliculated, surface with a very deep bluish-black metallic lustre; metasomal sterna sparsely and finely folliculated; seventh ventral plates broad and elongate with median and lateral edges reflexed, much as in productus (fig. 5).

**Female:** length 11.5 mm., wing length 8 mm.

Pile of face short, white, and dense, particularly between antennal bases and compound eyes; vertex with abundant, back pile, with a few intermixed pale grey hairs; upper galen areas with pile predominantly short, pale grey, with a few intermixed, longer, black hairs, pile becoming much longer, finer, and whiter below, a wide band of appressed, white pubescence immediately posterior to each compound eye; mesoscutum with anterior and lateral margins having pile short, dense, and white, discal area with abundant, black hair intermixed; scutellum with a narrow fringe of pale grey pile about peripheral margins, median discal area predominantly covered with black pile; mesepisterna with pile long, fine, and white; propodeum with dense fringes of long, white pile on latero-posterior margins, extending down lateroposterior margins toward pedicle, lateral and posterior faces with sparse covering of long, erect, white pile; pile of anterior two pairs of legs short and white, posterior legs with pile long, plumose, and tinged with light ochrace; first metasomal tergum with apical fascia broad and pure white, weakly interrupted medially, lateral fringes of long, white pile just barely reaching apical fascia, disc with abundant, long, erect, whitish pile; metasomal terga two to four with fasciae broad, rather dense, and white; metasomal tergum five with a very narrow apical white fascia; second metasomal tergum with a broad basal fascia, remnants of a white basal fascia just evident on third metasomal tergum; metasomal terga four and five with abundant, erect, black pile on discal areas; metasomal sterna with weak apical fringes of short, white pile, usually interrupted medially, discs of metasomal sterna with a few, erect, pale grey hairs, not at all scopalike.

Antennae brown, flagellar segments about as long as broad; malar
spaces one-third as long as broad; clypeus very weakly convex with a longitudinal median sulcus, surface coarsely but rather sparsely punctate with punctures one to two puncture widths apart, most densely punctate along median sulcus, interspaces shiny; vertex moderately shiny with numerous, very shallow, fine punctures; fascial foveae deep, slightly broadened medi ally, extending dorsally above inner margins of compound eyes, dorsal margins extending but one third of the way to lateral ocelli. Prothoracic spines very long and sharp, approximately three times as long as width across the base; mesoscutum densely punctate, punctures one-half to one puncture width apart over anterior one half and lateral margins, impunctate area large; scutellum rather coarsely punctate over posterior one half, punctures sparser and finer, becoming absent, on anterior face, punctures not at all striate; mesepisterna closely, coarsely, and deeply punctate, punctures no more than one-half puncture width apart with shiny interspaces; propodeum with basal area very finely rugate, not at all quadrately pitted, dull, lateral faces shiny and finely marked, posterior face dull and weakly roughened; tegulae brownish hyaline; wings dusky with a moderate covering of deep fulvous pubescence, especially apically, nervures dark brown; legs deep reddish brown; posterior basitarsi four times as long as broad. First metasomal tergum shiny, impunctate except for a few, very shallow, sparse follicles, surface tinged with a deep bluish-black lustre; second metasomal tergum shiny, rather densely and very finely folliculated; metasomal sterna shiny, coarsely and very sparsely folliculated, follicles one to four follicle widths apart.

Distribution: 1 female, Guaymas, Mexico, April 7, 1921 (E. P. Van Duzee) (cotype); 3 males, El Mayor, Baja California, April 1939 (C. D. Michener); 1 female, Wild Rose Canyon, Panamint Mountains, Inyo County, California, 7500 ft., May 28, 1937 (C. D. Michener), on Prosopis juliflora glandulosa; 1 female, Tombstone to Bisbee, Arizona, over 4500 ft., June 16, 1942 (H. A. Scullen); 1 male, 2 females, Big Bend Park, Hot Springs, Texas, April 11, 1949 (Michener-Beamer), on Prosopis juliflora.

The species has been taken on flowers of mesquite, Prosopis juliflora, and Timberlake also records a single specimen taken at the flowers of Melilotus. As far as present records indicate, perileucus appears to be a spring and early summer species.

The holotype from Sonora, Mexico, is in the California Academy of Sciences.
Colletes cercidii Timberlake
(Fig. 3)


This and the following species, C. rudis Timberlake, deviate slightly from the typical members of the productus group and are placed here with some hesitancy. The seventh ventral plates and the genital capsules resemble those of the productus group except for certain specific characters. Both sexes of cercidii bear some resemblance to skinneri Viereck and gilensis Cockerell, but do not have the coarse puncturation of either species. The males have the malar spaces one-half as long as wide; dark pile intermixed on the vertex, mesoscutum, and scutellum; and the first metasomal tergum finely punctate. The females are similar to skinneri, but have the malar spaces shorter, the first metasomal tergum more finely punctate, the second metasomal tergum weakly depressed basally, and the second and third terga with faint basal fasciae.

Male: length 10 mm., wing length 7.75 mm.

Pile of face very long, dense, and white, completely concealing clypeus and antennal basal region; vertex with pile long and sparse, strongly intermixed with black; genal areas with upper surface having sparse, short, pale grey pile with a few dark hairs intermixed on anterior margins, pile becoming much longer, finer, and whiter below; mesoscutum with pile predominantly pale grey to white, particularly about lateral and anterior faces, abundant, black pile intermixed over discal area, being most dense on median portions of disc; scutellum with a narrow fringe of pale grey pile about lateral and posterior faces, discs with pile predominantly long and black; mesepisterna with pile long, fine, and white; propodeum with long fringes of white pile on dorsal lateroposterior margins, lateral and posterior faces with abundant, long, erect, pale grey pile; legs with pile short, sparse, and white; first metasomal tergum with apical fascia broad, dense, and white, lateral fringes of long, white pile extending to apical fascia, disc with abundant, erect, whitish pile; metasomal terga two to five with fasciae broad, dense, and white; metasomal terga four to six with discs having abundant, short, black, erect pile; metasomal sterna two to five having apical fringes of long, pale grey pile, pile much shorter medially.

Antennae long, reddish brown to brown, flagellar segments one and one-half times as long as broad; malar spaces one-half as long as broad; clypeus flattened medially with a very shallow, longitudinal median line, surface finely and densely punctate over basal one-
half, punctures becoming much more striate apically, striate punctures extending virtually to apex; vertex shiny, sparsely punctate, punctures one to three puncture widths apart. Prothoracic spines absent; mesoscutum densely and coarsely punctate over anterior and lateral margins, punctures one-half puncture width apart, impunctate area small; scutellum rather densely and coarsely punctate over posterior three-quarters, anterior face shiny, impunctate; mesepisterna with punctures coarse and dense, having shiny interspaces, punctures one-half puncture width apart; propodeum with the basal area not at all pitted, having a few, very weak, irregular rugae, lateral and posterior faces dull and roughened; tegulae deep brown; wings dusky with abundant, deep fulvous pubescence, nervures brown; legs deep brown to black; posterior basitarsi four and one-fourth times as long as broad. First metasomal tergum finely and rather densely punctate, punctures coarser laterally, becoming much finer on median surface, punctures one to two puncture widths apart; metasomal terga two and three coarsely and rather densely folliculated, interspaces shiny; second metasomal tergum very weakly depressed basally; metasomal sterna shiny, coarsely and sparsely folliculated; seventh ventral plates broadly subtriangular, with apical margins extended and rounded, median margins strongly reflexed, with basal hair bands extending across base and down median reflexed margins (fig. 3).

*Female:* length 11.5 mm., wing length 8.5 mm.

Pile of face short and dense, particularly about antennal bases and along lower inner orbital margins; mesoscutum with pile pale grey about anterior and lateral faces with abundant, deep black pubescence on median discal area; scutellum with a very narrow fringe of pale grey pile about lateral and posterior faces, disc with abundant, erect, black pile; mesepisterna with pile long, fine, and pale grey; propodeum with dense fringes of long, pale grey pile on upper lateroposterior margins, extending down toward pedicel, lateral and posterior faces with abundant, erect, pale grey pile; anterior two pairs of legs with pile long and white, posterior pair of legs with abundant, long, plumose pile on femora and tibiae, strongly tinged with ochreus; first metasomal tergum with a very weak, white fascia, broadly interrupted medially, tergum with dense lateral fringes of white pile extending to fascia, disc with abundant, erect, pale grey pile; metasomal terga two to four with the fasciae weak, broad, and white, occasionally interrupted or partially interrupted medially; metasomal terga four and five with abundant, short,
deep fuscous to black, erect pile on discal areas; metasomal sterna two to four with very weak fringes of pale grey pile, discal area with abundant, erect, light ochreus pile, forming a weak scopa on metasomal sterna two and three.

Antennae long and reddish brown, flagellar segments one and one-eighth times as long as broad; malar spaces one-third as long as broad; clypeus flattened medially, very densely, coarsely, striately punctate to apex, interspaces shiny, a very faint trace of a median longitudinal sulcus; vertex shiny, sparsely punctate, with punctures one to three puncture widths apart with shiny interspaces; fascial foveae narrow and deep, curved at dorsal extremity toward lateral ocelli, inner margin of curve reaching just barely over one third of way from inner orbital margins to lateral ocelli. Prothoracic spines very short, vestigial; mesoscutum very coarsely and densely punctate over anterior and lateral margins, impunctate area very small, with punctures much sparser over median discal area; scutellum densely, finely, contiguously punctate about extreme lateral and posterior margins, punctures becoming much coarser and sparser toward anterior face, where they vary from one-half to one puncture width apart, anterior one third shiny, impunctate; mesepisterna deeply and densely punctate, with shiny interspaces, punctures one-half puncture width apart; propodeum with basal area smooth, very shallowly pitted, pits not at all uniformly quadrate, lateral and posterior faces roughened, dull; tegulae deep brown to black; wings dusky with abundant, deep fulvous pubescence, nervures dark brown; legs dark brown to black; posterior basitarsi three and three-fourths times as long as broad. First metasomal tergum finely and densely punctate, with shiny interspaces, punctures approximately one puncture width apart, punctures of apical and median faces much finer than lateral discal areas; second metasomal tergum very finely and densely folliculated, surface dull, second metasomal tergum with a weak basal depression; metasomal sterna shiny, coarsely and densely folliculated.

Distribution: Timberlake records the holotype male and the allo-type female from Box Canyon, Riverside County, California, on March 31, 1934, on Cercidium torreyanum, and the following paratypes on the same flower: 2 males and 2 females, Box Canyon, March 31 and April 13, 1934; 1 female, Oasis, Riverside County, March 27, 1934; 1 female, Gila Bend, Arizona, March 28, 1934 (Timberlake); 1 female, Morristown, Arizona, May 21, 1945; 1 male, Potholes, Imperial County, California, April 10, 1923 (E. P. Van Duzee).
I have seen the male paratype from Box Canyon, April 13, 1934, the female paratype from Gila Bend, Arizona, and the male paratype from Potholes. The types are in the collection of the Citrus Experiment Station, Riverside, California.

**Colletes rudis** Timberlake

*(Fig. 4)*


The species is described from two males taken at Indio, California. It is a rather unique species with roughly quadrate seventh ventral plates. There is a slight resemblance to *C. productus* but *rudis* has only a few black hairs on the posterior portion of the scutellum; the malar spaces are shorter, approximately three-fourths as long as wide; and the metapleural prominences are absent.

**Male:** length 10 mm., wing length 7 mm.

Pile of face long, dense, and white, completely concealing clypeus and antennal bases; vertex with pile rather dense and tinged with grey, a few darker hairs intermixed; genal areas with upper surfaces having abundant, short, pale grey pile, pile becoming much longer, finer, and whiter below; mesoscutum with pile long, dense, and predominantly pale grey, a few darker (not black) hairs intermixed on median discal area; scutellum with very dense lateral and posterior rims of pale grey pile, pile having a few black hairs intermixed; mesepisterna with pile long, fine, and white; propodeum with long, pale grey fringes of pile on upper lateroposterior margins, lateral and posterior faces with abundant, erect, pale grey pile; legs with pile short, sparse, and white; first metasomal tergum with apical fascia broad and white, lateral fringes of pale grey pile weak, barely reaching to apical fascia, disc with abundant, erect, pale grey pile; metasomal terga two to four with fasciae broad, weak, and pure white; fascia of fifth metasomal tergum very weak, evident only as an apical fringe of fine, white pile; metasomal terga three to six with abundant, very short, black, erect pubescence, not at all concealing surface; metasomal sterna two to five with long apical fringes of white pile, pile somewhat shortened medially.

Antennae long, deep brown to black, flagellar segments one and one-fourth times as long as broad; malar spaces three-fourths as long as broad; clypeus weakly convex, flattened medially, very finely and densely punctate over basal three-fourths, punctures becoming somewhat striate and much sparser on lateroapical margins; vertex dull, densely and deeply punctate. Prothoracic spines very short; mesoscutum very coarsely and densely punctate over anterior and
lateral faces, impunctate area very small with numerous coarse punctures lying irregularly on median area; scutellum finely, densely, continguously punctate about lateral and posterior edges, punctures becoming coarser and sparser anteriorly, never more than one-half puncture width apart to anterior face; meseptisterna coarsely, densely, almost continguously punctate, with shiny, linear interspaces, interspaces becoming dull below; propodeum with basal area shallowly, irregularly, quadrately pitted, lateral and posterior faces dull and roughened; tegulae deep brown to black; wings with abundant, deep fulvous pubescence, nervures brown; legs black; posterior basitarsi four times as long as broad. First metasomal tergum densely punctate with moderately fine punctures, punctures becoming much sparser and finer medially and on anterior portions, punctures approximately one-half to one puncture width apart laterally; second metasomal tergum very densely and finely punctate or coarsely folliculated, punctures one-half to one puncture width apart; metasomal sterna shiny, finely and sparsely folliculated; seventh ventral plates roughly quadrate with lateral and median margins weakly reflexed (fig. 4).

Distribution: One male, 5½ miles west of Indio, California, February 18, 1946 (P. H. Timberlake), at the flowers of Encelia farinosa (holotype).

I have only seen the holotype. However, Timberlake records a male paratype taken at the same time and place as the holotype. The types are in the collection of the Citrus Experiment Station, Riverside, California.

Colletes gilensis Cockerell

(Fig. 6)


The species occurs in the southwestern part of the United States and in northern Mexico, from Colorado south to New Mexico and Arizona and east to the Big Bend country of Texas. It can be distinguished by its very large size and the very coarse punctuation of the metasomal terga, but may be confused with compactus Cresson. The males, however, have short malar spaces, about one-half
as long as broad, and the female lacks the elevated ridges on the last metasomal sternum.

Male: length 14 mm., wing length 10 mm.

Face with pile coarse, dense, and pure white, completely concealing the clypeus, a few darker hairs along inner orbital margins; vertex with mixture of black and light pile; genal areas with upper surfaces having a few black hairs but predominantly white, pile becoming very long, white, and plumose on lower surfaces; mesoscutum with strong mixture of black pile; scutellum with abundant, long, black and pale grey pile on posterior and lateral faces; mesepisterna with long, fine, plumose pile, white below with a few black hairs on pre-episterna; propodeum with dorsolateral margins with dense clump of long, pure white pile, lateral and posterior faces with abundant, very fine, erect, white pile; legs with pile white, sparse, and long; metasomal terga one to five with broad, dense, white apical fasciae; metasomal tergum one with lateral fringes of pure white pile to apical fascia, disc and anterior face with abundant, fine, erect pile; metasomal tergum two with few, very fine hairs over basal portion; metasomal terga three to six with abundant, short, black, erect discal pile; metasomal tergum six lacking apical fascia; metasomal tergum seven with deep brown, appressed pile; metasomal sterna two to five with broad apical fasciae of pure white pubescence, broadest medially on terga two to four; metasomal sterna three to five with abundant, long discal pile tinged with ochreus.

Antennae long and brown, flagellar segments one and one-half times as long as broad; malar spaces one-half as long as broad; clypeus weakly convex with sharp median longitudinal sulcus, sulcus with close punctures, lateral clypeal areas coarsely and densely punctate over basal half, punctures sparse with broad shiny interspaces apically; vertex densely punctate with shiny interspaces. Prothoracic spines long and sharp, about one and one-half times the width across the base; mesoscutum densely and coarsely punctate, punctures contiguous to one-half puncture width apart over anterior and lateral margins, impunctate area small; scutellum with anterior one-fourth shiny and sparingly punctate, posterior three-fourths coarsely and densely punctate to posterior margin where punctures are contiguous; mesepisterna coarsely and densely punctate with shiny interspaces, tending to striately punctate above; propodeum having basal area broad with weak, quadrate pits, lateral and posterior faces dull, roughened, and weakly rugose; tegulae deep
brown; wings dusky with abundant, long, brownish pubescence over apical half, nervures brown; legs dark brown; posterior basitarsi four and one-half times as long as broad. Metasomal tergum one coarsely and densely punctate, punctures no more than one-half puncture width apart, a weak median longitudinal impunctate ridge transversing disc, extreme apical margin raised as a flange-like apex with a shallow preapical groove, most evident at medial area; metasomal terga two and three densely and coarsely punctate, punctures one-half to one puncture width apart; metasomal tergum two sharply depressed basally; metasomal terga three to six with punctures of variable coarseness with shiny interspaces; metasomal sterna shiny and sparsely folliculated or weakly punctate; seventh ventral plates transversely quadrate with laterobasal process long (fig. 6).

Female: length 14.5 mm., wing length 11 mm.

Face with pile sparse, white, and erect, a few hairs overhanging clypeus from frontoclypeal suture; vertex with mixture of long black and shorter pale grey pile; genal areas with upper surfaces having mixture of black and pale grey pile, becoming longer and much finer to pure white below; mesoscutum with mixture of black and pale grey pile extending to extreme anterior surface; scutellum with strong covering of long, black pile intermixed with shorter, finer, pale grey hairs particularly about extreme margins; mesepisterna with pile long, fine, and pure white, a few darker hairs on preepisterna; propodeum with dense lateroposterior clumps of long, white pile, lateral and posterior faces with few, scattered, long, fine, white hairs; anterior pair of legs with long, white femoral pile, tibiae and tarsi with pile tinged with ochreus, second and third pairs of legs with pile tinged with ochreus, a few, short, spinelike hairs on upper surface of posterior tibiae; metasomal terga one to five with dense, white apical fasciae, much narrowed on tergum five; metasomal tergum one with long lateral fringes of white pile, disc and anterior face with few, short, fine hairs; second metasomal tergum with weak basal fascia; metasomal terga three and four with few, short, white hairs forming rudiments of weak basal fascia; metasomal terga two to five with discal areas having short, black, erect pubescence; metasomal tergum six with pile golden to brown and appressed; metasomal sterna with apical margins having few, short, fine, white hairs, discal areas with abundant, fine, erect pile tinged with ochreus.

Antennae reddish brown, flagellar segments as long as broad; malar spaces three-eighths as long as broad; clypeus weakly convex
with median longitudinal sulcus not reaching apex or base, sulcus with few, coarse, contiguous punctures, lateral faces coarsely and striately punctate, closely punctate about base and sparsely punctate with broad shiny interspaces apically; vertex shiny, finely punctate; fascial foveae narrow and long, broadened sharply medially, dorsal portions pointed and curved, reaching two thirds of the way to lateral ocelli. Prothoracic spines long, about one and one-half times as long as width across base; mesoscutum densely and coarsely punctate, punctures no more than one-half puncture width apart about anterior and lateral margins, impunctate area small; scutellum with anterior one fourth shiny and sparingly punctate, posterior three fourths becoming more densely and finely punctate toward posterior margins; mesepisterna coarsely and densely punctate with punctures becoming much finer on posterior faces, almost rugosely punctate with shiny interspaces; propodeum with basal area broad, shallowly, quadrately pitted, lateral and posterior faces dull and weakly roughened; tegulae brown; wings dusky with abundant, long, brownish pubescence over apical one third, nervures brown; legs brown; posterior basitarsi three and one-third times as long as broad. Metasomal tergum one coarsely and densely punctate, punctures varying from one-half to one puncture width apart, apical margin reflexed slightly with a shallow preapical groove most evident medially, shallow longitudinal median impunctate ridge; metasomal tergum two with punctures deep and sparser than on tergum one, basal area sharply depressed, apical margin slightly reflexed; metasomal tergum three with punctures shallow, finer, and separated by one to three puncture widths; metasomal terga four and five shiny and finely punctate; metasomal sterna shiny, coarsely folliculated, apical margins hyaline, impunctate.

Distribution: Colorado: Pueblo; Grand Junction; Colorado Springs; Boulder; Greeley; Halls Valley. New Mexico: Las Vegas; White Mountains; Gila; Jemez Springs; Socorro County. Arizona: Oak Creek Canyon; Huachuca Mountains; Grand Canyon; Flagstaff. Texas: Davis Mountains; Chisos Mountains, Big Bend National Park.

Flight Records: This appears to be an aestival species, occurring from June 15 to August 21.

Plant records: Melilotus alba, Petalostemum candidus, P. flavescent, P. oligophyllus, Potentilla thurberi, Solidago canadensis.

The type of this species, a male from West Fork of the Gila River,
New Mexico, has not been located. It was last recorded in the Cockerell collection.

*Colletes skinneri* Viereck

(Fig. 7)


This species is most likely to be confused with *C. gilensis* or *vandykei* Timberlake. However, both sexes can be readily distinguished by the malar spaces, which surpass both the aforementioned species in length. The malar spaces of the male are approximately one and three-eighths times as long as broad, and those of the female three-quarters as long as broad, much longer than its closest relative, *gilensis*, in which these spaces are almost linear.

**Male:** length 10 mm., wing length 7.5 mm.

Pile of face long, most dense about antennal bases, clypeus incompletely concealed with a long, overhanging fringe of pile from clypeofrontal regions, pile mostly pale grey with a few darker hairs intermixed below and mesad to antennal bases; vertex with a mixture of dark and pale grey pile, sparse; genal areas with a weak covering of short, pale grey to light ochreus pile above, pile becoming much longer, denser, and finer below; mesoscutum with a strong admixture of black pile, particularly on median discal area, pile about anterior and lateral faces predominantly pale grey to tinged with yellowish; scutellum with a narrow fringe of pale grey pile about lateral and posterior faces, pile of disc predominantly black; mesepisterna with a sparse covering of long, fine pile, pile tending to grey to tinged with ochreus above, becoming much whiter to pale grey below; propodeum with long fringes of dusky pile along upper lateroposterior margins, lateral and posterior faces with abundant, long erect, pale grey pile; legs with pile long, sparse, and pale grey; first metasomal tergum with apical fascia weak and white, broadly interrupted medially, lateral fringes of pale grey pile weak, barely extending to apical fascia, disc with abundant, erect, pale grey pile; metasomal terga two to five with fasciae weak and pure white, often interrupted medially; metasomal terga three to six with discs having abundant, very short, black pile intermixed with a few, longer, pale grey hairs, not at all concealing surface; metasomal sterna two to four with narrow apical fringes of white to pale grey pile.
Antennae deep reddish brown, flagellar segments one and one-third times as long as broad; malar spaces one and three-eighths times as long as broad; clypeus convex with a longitudinal median sulcus, rather densely and coarsely, striately punctate about laterofrontal regions and down longitudinal median sulcus, lateroapical regions sparsely punctate with broad, shiny interspaces; vertex deeply and coarsely punctate with shiny interspaces, punctures contiguous to one-half puncture width apart; compound eyes weakly petiolate as viewed from above. Prothoracic spines very short and sharp; mesoscutum densely and coarsely punctate over anterior one half and lateral margins, punctures no more than one-half puncture width apart, impunctate area small; scutellum densely and coarsely punctate over posterior two thirds, punctures contiguous except along median longitudinal line, anterior face sparsely punctate to virtually impunctate; mesepisterna densely, weakly striately punctate above, dull, punctures becoming less striate on lower faces and interspaces more shiny; propodeum with basal area being shallowly and quadrately pitted, lateral and posterior faces dull and roughened; tegulae brownish hyaline; wings dusky, very densely covered with a deep fulvous pubescence, nervures dark brown; legs reddish brown to black; posterior basitarsi four times as long as broad. First metasomal tergum very densely and coarsely, almost contiguously punctate over entire surface, punctures slightly sparser along median anterior face, surface rather dull; second metasomal tergum densely punctate, punctures one-half to one puncture width apart, being much finer and denser medially and basally; metasomal sterna shiny, sparsely and weakly folliculated; seventh ventral plates closely resembling those of gilensis but having median fringe much longer and denser (fig. 7).

**Female:** length 11 mm., wing length 8 mm.

Pile of face long, white to pale grey with a few darker hairs intermixed below antennal bases; clypeus with a weak covering of overhanging, pale grey pile; vertex with pile predominantly long and black amongst finer, pale grey hairs; genal areas with abundant, erect, pale grey pile, pile becoming much longer, finer, and whiter below, with a very weak rim of short, appressed, white pubescence immediately posterior to each compound eye; mesoscutum with abundant, black pile intermixed with pale grey, black pile becoming most predominant on median discal area; scutellum with a lateral and posterior fringe of long, pale grey pile, discal area covered with erect, black pile; mesepisterna with pile long, fine, pale grey to
white; propodeum with long fringes of white to pale grey pile on lateroposterior margins, extending down toward the pedicel, lateral and posterior faces with pile long, fine, and erect; pile of anterior two pairs of legs has long, white fringes from the femora, posterior legs with pile rather sparse, long, plumose, and tinged with ochreus, particularly on femora and tibiae; first metasomal tergum with apical fascia narrow and white, broadly interrupted medially, lateral fringes of pale grey pile weak and barely reaching apical fascia, disc with sparse, erect, whitish pile, pile short; metasomal terga two to five with fasciae white and broad, sharply narrowed medially; metasomal terga three to five with abundant, erect, black pile on discal areas, pile becoming much longer on apical terga; metasomal sterna with very weak fringes of short, pale grey pile on extreme apical margins.

Antennae brown, flagellar segments about as long as broad; malar spaces three-fourths as long as broad; clypeus weakly convex, flattened medially to having a very weak, longitudinal median groove, clypeus rather coarsely and densely striately punctate about clypeofrontal regions and along median depressed sulcus, lateroapical portions shiny and very sparsely punctate; vertex densely punctate with shiny interspaces; fascial foveae sharply delineated, narrow, curving inward from dorsal margins of compound eyes toward lateral ocelli, reaching almost one-half way to lateral ocelli from upper inner orbital margins. Prothoracic spines short and heavy; mesoscutum very densely and coarsely punctate over entire surface, punctures no more than one-half puncture width apart, impunctate area absent; scutellum with extreme posterior and lateral margins finely, contiguously punctate, dull, punctures much coarser over discal area with shiny, linear interspaces, scutellum punctate to anterior margin, a weak longitudinal median groove extending length of scutellum; mesepisterna densely, weakly striately punctate, punctures no more than one-half to one puncture width apart, surface dull; propodeum with basal area narrow and very shallowly pitted, lateral and posterior faces dull and roughened; tegulae deep brown; wings dusky with abundant, fulvous pubescence, nervures brown; legs brownish black; posterior basitarsi four times as long as broad. First metasomal tergum very densely and coarsely punctate, punctures one-half to one puncture width apart except on a median longitudinal impunctate line where punctures are very sparse to absent, interspaces shiny; second metasomal tergum very finely punctate or coarsely folliculated, interspaces shiny; metasomal sterna
coarsely and rather densely folliculated on apical half of each sternum, surface shiny.

**Distribution:** One female, Beulah, New Mexico (Skinner) (holotype); 1 male, Beulah, New Mexico, August 18 (T. D. A. Cockerell) (allotype); 1 female, Catalina Mountains, Arizona, August 21, 1942 (E. C. Van Dyke).

The holotype from New Mexico is in the Academy of Natural Sciences of Philadelphia.

**Colletes vandykei** Timberlake

(Fig. 8)


This species is based on a single male taken from the Santa Rita Mountains of Arizona. It is similar to *arizonensis*, differing in its exceptionally large size and in having abundant, black pile extending well down the mesepisterna. The apical margins of the first metasomal terga in both species are very similar in that the fasciae do not lie in abruptly depressed margins but rather fringe a broadly rounded apex, in both species there is evidence of a very narrow and weak preapical groove, particularly laterally. Genitally the species is very similar to *arizonensis*, *skinneri*, and *gilensis*. The seventh ventral plates of *vandykei* are much more distinctly quadrrate than either of the above-mentioned species and have the laterobasal projections much shorter and blunter.

**Male:** length 13 mm., wing length 9.25 mm.

Pile of face long about antennal bases and along lower inner orbital margins, with a strong admixture of black pile immediately below antennal bases; clypeus covered partially by an overhanging fringe of pale grey pile; vertex with a mixture of black and pale grey pile, particularly in ocellar triangle; upper genal areas with pile predominantly pale grey, however having a few darker hairs on anterior face, pile becoming much longer, finer, and pure white below; mesoscutum strongly covered with a mixture of black and pale grey pile, black predominating medially; scutellum with but a very narrow, lateral and posterior fringe of pale grey pile, discal area with abundant, long, black pile; mesepisterna with an admixture of pale grey, dark, and black pile on upper half, pile predominantly light to pale grey below; propodeum with very dense fringes of black and white pile on upper lateroposterior margins, dense fringes extending down toward pedicel and becoming whiter ventrally, lateral and posterior faces with abundant, erect, dusky pile; pile of legs short, sparse, and predominantly white, with a
weak admixture of black pile most evident on fringes of prefemora; first metasomal tergum with a narrow apical fascia of pure white pile, interrupted medially, lateral fringes of pale grey pile weak, barely reaching apical fascia, disc with abundant, very short, whitish pile; metasomal terga two to four with narrow, white apical fasciae, broadly interrupted medially; metasomal terga five and six with abundant, erect, black pile on the discal areas; metasomal sterna two to five with very weak apical fringes of pale grey pile.

Antennae deep brown to black, flagellar segments one and one-fourth times as long as broad; malar spaces one-half as long as broad; clypeus convex, weakly flattened medially, surface very coarsely, striately punctate about laterobasal edges and down a median longitudinal line to apex, lateroapical portions shiny, impunctate; vertex densely punctate, punctures contiguous to one puncture width apart, interspaces shiny. Prothoracic spines very short and sharp, about as long as width across base; mesoscutum very densely and coarsely punctate, punctures almost contiguous on anterior two-thirds and lateral margins, impunctate area absent; scutellum densely and coarsely punctate over entire surface, a deep longitudinal median groove running to anterior margin, mesepisterna with punctures coarse and dense, one-half to one puncture width apart with interspaces shiny; propodeum with basal area having a number of weak, longitudinal rugae, not at all forming quadrate pits, lateral and posterior faces dull and roughened; tegulae deep brown to black, rather finely and densely punctate; wings dusky with abundant, deep fulvous pubescence, nervures dark brown; legs black; posterior basitarsi four times as long as broad. First metasomal tergum densely covered with moderately coarse punctures, punctures much finer than those of mesoscutum and approximately one puncture width apart, interspaces shiny, apical margin very weakly reflexed, giving it a blunt, rounded appearance and also giving an impression of a very shallow, preapical groove, most evident laterally; metasomal terga two, three, and four very coarsely and sparsely folliculated, follicles varying from one to three follicle widths apart, interspaces shiny, black; metasomal sterna shiny, coarsely and sparsely folliculated; seventh ventral plates much more quadrate than either *skinneri* or *gilenosis* and having laterobasal projections short and blunt (fig. 8).

**Distribution:** One male, Madera Canyon, Santa Rita Mountains, Arizona, August 15, 1940 (E. C. Van Dyke) (holotype).

The type is in the collection of the California Academy of Sciences.
Colletes compactus Cresson (Fig. 9)


This is one of the more robust forms of the genus and is distributed throughout North America south of the Boreal zone. The male is readily distinguished by the long malar spaces and deep median longitudinal sulcus of the clypeus, and the female has strong elevated lateral ridges on the last metasomal sternum. There is a progressive decrease in the ratio of black to white pile from the type locality in the east to the western part of the Great Plains, but through this range the black pile of the thoracic dorsum is evident.

**Male:** length 11 mm., wing length 8 mm.

Face with pile long and dense about antennal bases, much shorter and appressed along lower inner orbital margins, abundant, long, white pile overhanging clypeus from frontoclypeal suture and concealing upper and lateral surfaces; inner orbital margins with mixture of long, black hairs below antennal bases; vertex with mixture of black and light ochreous hairs; genal areas with upper surfaces with mixture of black and dusky pile, becoming longer, denser, and pure white on lower surfaces; mesoscutum with mixture of long, weakly plumose, dusky and black pile, black pile predominating over posterior portions of disc; scutellum with pile very long, plumose, and mostly black; mesepisterna with pile pale grey, weak ad-mixture of black hairs above and on pre-episterna; propodeum with strong lateroposterior fringes of pale grey pile, lateral and posterior faces with abundant, long, erect, pale grey pile, not concealing surface; legs with pile sparse, fine, and white; metasomal terga one to five with broad apical fasciae weakly covered with pure white, short pubescence; metasomal tergum one with fascia narrow, almost
absent medially, lateral fringes of long, white pile, discal area and anterior face with abundant, fine, erect pile; metasomal terga four to six with scattered, long, erect, ferrugineous hairs; metasomal tergum seven with pile brown, appressed; metasomal sterna two to five with broad apical fasciae of pure white pile.

Antennae long and brown, flagellar segments one and three-fourths times as long as broad; malar spaces as long as broad; clypeus long with a deep longitudinal median sulus bordered by two, lateral, shiny, sparsely punctate rims, a few shallow punctures along medial sulus; vertex dull, sparsely and weakly punctured with narrow, shiny interspaces. Prothoracic spines short and sharp, about as long as the width across the base; mesoscutum densely and coarsely punctate with punctures one-half to one puncture width apart on anterior and lateral faces; scutellum with anterior one-half impunctate except for a few, shallow, puncturelike depressions, surface shiny, posterior one-third closely and densely punctate with punctures contiguous on posterior margin; mesepisterna coarsely and closely punctate, punctures about one puncture width apart with shiny interspaces; propodeum with basal area broad, not pitted but with irregular striae, lateral and posterior faces finely roughened, not striate or rugose; tegulae light brown; wings whitish hyaline with scattered, fine, light pubescence apically, nervures brown; legs reddish brown; posterior basitarsi five and one-half times as long as broad. Metasomal tergum one densely and coarsely punctate over entire surface, punctures almost contiguous with linear, shiny interspaces; metasomal tergum two with punctures deep and coarse as first tergum but separated by one to two puncture widths, basal area sharply depressed, apical fascia in smooth hyaline depression most evident laterally; metasomal terga three to six shiny, weakly punctate or folliculated; metasomal sterna shiny, finely and densely folliculated apically; seventh ventral plates roughly quadrate, with median, lateral, and basal margins reflexed, discs densely covered with pile (fig. 9).

**Female:** length 13 mm., wing length 9 mm.

Face with strong mixture of black and pale grey pile about antennal bases and lower frontal regions; clypeus bare; except for a few overhanging hairs from frontoclypeal margin; vertex with pile long, predominantly black with finer, intermixed, pale grey hairs; genal areas with upper surfaces having black pile predominating, pile becoming longer, denser, and pure white on lower surfaces; mesoscutum with dense covering of black and white pile; scutellum
with pile long and black about anterior and lateral margins; mesepisterna with pile long, white, and plumose, a few dark hairs on extreme upper surfaces; propodeum with lateroposterior margins with strong fringe of pale grey to light ochreus pile, occasionally with a few, scattered, dark hairs, lateral and posterior faces with few, fine, light hairs; legs with pile white, except on posterior femora and tibiae where it is tinged with ochreus and having some short, spinelike, dark hairs on upper faces; metasomal tergum one with weak apical fascia only evident laterally; metasomal terga two to four with fasciae broad, pure white, and weak; metasomal terga three to five with a few, erect, long, brown hairs on discs; metasomal tergum six with pile deep brown to black and appressed; metasomal sterna with a few, light ochreus hairs along apical margins.

Antennae brown, flagellar segments as long as broad; malar spaces three-eighths as long as broad; clypeus with median portion flattened to weakly concave, surface roughened and dull with scattered, coarse, shallow punctures separated by one to two puncture widths; vertex finely and densely punctate with shiny interspaces. Prothoracic spines absent; mesoscutum coarsely and densely punctate over anterior half and lateral margins, punctures almost contiguous, median impunctate discal area large; scutellum with anterior two thirds shiny, impunctate, posterior one third with punctures obscure and dense; mesepisterna coarsely and densely punctate with shiny interspaces; propodeum with basal area broad, not pitted but with numerous longitudinal striae, lateral and posterior faces dull and weakly roughened; legs deep reddish brown; posterior basitarsi three and three-fourths times as long as broad; metasomal tergum one with disc finely and densely punctate, punctures varying from one-half to one puncture width apart; metasomal tergum two with disc very finely punctate, punctures approximately one puncture width apart and slightly smaller than those on tergum one, apical fascia in sharply declivous hyaline depression; metasomal terga three to five with discs shiny, weakly punctate or folliculated; metasomal sterna two to four coarsely and sparsely folliculated, one to three follicle widths apart, apical margins light hyaline; last metasomal sternum with two, strongly elevated, lateral ridges extending from base to apex, converging slightly and most pronounced apically.

Distribution: The subspecies is found throughout America south of the Boreal zone and east of the Great Divide, occurring in greatest abundance in the eastern, particularly seaboard, portions of the
United States and Canada. On the basis of present collections, *c. compactus* is not known to occur in the deep south, but a male from Flagstaff, Arizona, as well as material from Meadow Valley, Mexico, suggests that the species may extend along the foothill regions into the Arizona and Mexican plateaus.

Marginal localities include: Roundhill, Nova Scotia; St. John, New Brunswick; Bryson City, North Carolina; Atlanta, Georgia; Ozark Lake, Missouri; Manhattan, Kansas; southern Arizona; Milwaukee, Wisconsin; and Midland County, Michigan.

*Flight records:* The species has been recorded as flying between July 10 (New Jersey) and November 11 (North Carolina), reaching its maximum abundance during September and early October.

*Plant records:* *Aster multiflorus* and *Solidago* sp. are the only two plants this bee has been recorded as visiting. Robertson suggests it is oligotropic on Compositae.

The types from Connecticut and Illinois are in the Academy of Natural Sciences of Philadelphia.

*Colletes compactus hesperius* Swenk


Colletes compactus, Timberlake (not Cresson), 1951, Wasmann J. Biol., vol. 9, p. 196.

The form, originally described by Swenk in 1906, was reduced to subspecific rank in 1908. *C. c. hesperius* has the black pile of the body reduced and even absent in some cases, and although there is considerable variation in size, both sexes are larger than their eastern counterparts. There is some question as to the exact area of intergradation of these two subspecies, for specimens from Flagstaff, Arizona; Meadow Valley, Chihuahua, Mexico; and Golden, Colorado, all exhibit characters intermediate between the Washington type and typical *c. compactus*. A single male taken at Flagstaff, Arizona, resembles *c. compactus* closely except for a slight reduction in the amount of black pile present on the head and thoracic dorsum. Another male from Murray, Utah, has the black pile absent from the head and present only on the mesoscutum and scutellum; this cline appears to terminate in the more northerly specimens from Washington and British Columbia, which have the pile of the body all white except for a few dark hairs on the scutellum. The length and density of the pile of the body varies inversely with the presence of black.
In the females this feature is even more evident. Although I have seen no Arizona material, two females from Escalante and Bryce Canyon, Utah, have a strong admixture of black pile on the mesoscutum and vertex. The ratio of black to white decreases in material from northern Utah and southern Oregon, where the pile of the inner orbital margins is tawny grey to dusky and that of the vertex dusky with a few black hairs intermixed.

The single female from Chimney Gulch, Golden, Colorado, deviates strongly from *c. compactus* of the western plains and bears a close resemblance to material from Washington and British Columbia, for there is no black pile on the vertex nor along the inner orbital margins and the pile of the mesoscutum is predominantly dusky to tawny grey.

**Male:** Similar to *c. compactus* except in having inner orbital margins with a few dark hairs, not black; mesoscutum and scutellum with few black hairs; apical metasomal fasciae broader and denser; malar spaces one and one-fourth times as long as broad.

**Female:** As in *c. compactus* except in having face with no dark pile and much larger (14-15 mm.); vertex with few to no black hairs; mesoscutum and scutellum with black pile restricted to median discal area; malar spaces slightly longer, about one-half as long as broad; second metasomal tergum sharply depressed basally, containing a broad basal fascia at least as wide as apical fascia.

**Distribution:** Arizona: Flagstaff. Utah: Bryce Canyon; Escalante; Murray; Springville; Granger; Taylorsville; Mills. Idaho: Parma. California: Old Station, Shasta County; Gazelle, Siskiyou County; Mohave Desert. Oregon: Echo; Rufus, Sherman County. Washington: Hunt’s Junction; Almota, Whitman County; Yakima. British Columbia: Oliver; Walthachin; Vernon; Penticton; Lillooet; Okanagan. Colorado: Chimney Gulch, Golden.

**Flight records:** The species has been taken between August 30 and October 15.

The types from Almota, Whitman County, Washington, are in the collections of the University of Nebraska.
**Revision of the Bee Genus Colletes**

**Group III—latitarsis**

*Colletes latitarsis* Robertson

(Fig. 10)


This species is distinctive but may be confused with *willistoni* Robertson. The males can readily be distinguished by having the posterior basitarsi two and one-fourth times as long as broad and by having the fifth sternal segment with its posterior margin strongly curved anteriorly from two posterior lateral angles. The female has the second tarsal segment of each hind leg short, approximately as long as broad, whereas the same segment in *willistoni* is one and one-half times as long as broad. In the female of *latitarsis* the posterior basitarsi are very broad, about two and one-fourth times as long as broad and the posterior tibiae are clothed with a mixture of grey and black pile.

**Male:** length 9.5 mm., wing length 6.25 mm.

Face with pile pure white, long, and dense about antennal bases and along inner orbital margins; clypeus bare except for a few long hairs overhanging from lateral margins; vertex with a few, dark, long hairs, but predominantly short, white pile; genal areas with pile pure white, becoming much longer and whiter on lower regions; mesoscutum with strong admixture of black and white pile; scutellum with the disc predominantly covered with black pile, lateral and posterior margins with fringe of longer, pure white pile; mesepisterna with the pile long, fine, and white; propodeum with strong clump of black and white pile on lateroposterior margins, lateral and posterior faces of propodeum with short, white pile not concealing surface; anterior femora and tibiae with very long, white pile, second and third pairs of legs with the pile short, sparse, and pale grey; metasomal terga one to five with broad, white apical fasciae; first metasomal tergum with dense lateral fringes of white pile extending to fascia, anterior face and discal area with abundant, erect, fine, white pile not concealing surface; metasomal terga two to five with abundant, short, deep fuscous to black pile on disc;
metasomal tergum six with pile semiappressed and deep golden; metasomal sterna one to five with apical fringes of ochreus pile, almost comblike; tergosternal margins with abundant black pile; metasomal sternum five with apical fringe of deep fuscous to black pile.

Antennae short, reddish brown, middle flagellar segments short, as long as broad; malar spaces seven-eighths as long as broad; clypeus flattened with shallow longitudinal median sulcus, surface shiny with a number of obscure longitudinal punctures; vertex shiny with scattered fine punctures. Prothoracic spines long and sharp, longer than width across base; mesoscutum closely and coarsely punctate, punctures almost contiguous over entire surface with shiny, almost linear, interspaces, impunctate area absent; scutellum with anterior surface sparsely punctate with fine punctures, punctures becoming coarser and more dense toward posterior margin, interspaces shiny; mesepisterna deeply and coarsely punctate, punctures almost contiguous above, tending to one-half puncture width apart below; propodeum with basal area deeply, quadrately pitted, lateral and posterior faces shiny and weakly striate, posterior face separated from lateral by weak longitudinal striae; tegulae deep brown; wings dusky with abundant, short, fine, brown pubescence, nervures brown; legs brown; posterior basitarsi two and one-fourth times as long as broad. Metasomal terga one and two deeply punctate with punctures varying from one to two puncture widths apart, becoming finer and denser toward extreme apical margins; metasomal terga three to five shiny and weakly folliculated; metasomal sterna shiny with apical margins of metasomal terga three and four weakly emarginate medially; metasomal sternum five strongly excavated from two lateral margins; seventh ventral plates as illustrated (fig. 10).

Female: length 10 mm., wing length 6 mm.

Face with pile white, short, and concentrated principally along lower inner orbital margins; clypeus bare; vertex with mixture of black and white pile; genal areas with pile short and pure white; mesoscutum with mixture of black and white pile over entire disc; scutellum with the disc completely covered with short, black pile, lateral and posterior margins with a fringe of short, white pile; mesepisterna with pile fine and white; pre-episterna with mixture of black and white pile; propodeum with lateral and posterior faces having abundant, short, white pile not concealing surface, latero-posterior margins with strong clump of pure white pile; legs with pile pale grey to deep fuscous; posterior femora and tibiae with pile
mainly black; metasomal terga one to four with apical fasciae pure white; first metasomal tergum with weak lateral fringes of white pile, disc with few, fine, white, erect hairs; metasomal terga three to five with discs covered with short, fine, erect, black pile; metasomal tergum six with pile semiappressed, black to deep golden; metasomal sternum with mixture of erect, black and ochreus pile, not fasciated.

Antennae brown, short; flagellar segments three-fourths as long as broad; malar spaces one-third as long as broad; clypeus flattened with a deep median longitudinal suture, shiny with elongate obscure punctures; vertex shiny and sparsely punctate. Prothoracic spines long and sharp, longer than width across base; mesoscutum very coarsely, densely punctate with punctures one-half puncture width apart, almost contiguous on extreme anterior and lateral faces, impunctate area absent; scutellum with punctures smaller on anterior one third, becoming larger and much more dense toward posterior face; mesepisterna shiny, deeply punctate with punctures approximately one-half puncture width apart; propodeum with the basal area deeply, quadrately pitted, lateral and posterior faces dull and finely striate; tegulae deep brown; wings dusky with abundant, fine, brown pubescence, nervures brownish black; legs reddish brown; posterior basitarsi two and one-half times as long as broad; second tarsal segment of hind leg as long as broad at widest points. Metasomal tergum one closely and deeply punctate over entire surface, becoming finer and denser on extreme apical margins; metasomal tergum two with punctures much finer and denser than those of first; metasomal terga three to five densely folliculated; metasomal sternum dull and finely and densely folliculated; metasomal sternum four and five with apical margins emarginate medially.

Distribution: The species is sparingly distributed over eastern America to the tablelands of Arizona. Marginal areas include: Forsythe, Montana; Pierre, South Dakota; Faribault, Minnesota; St. Croix County, Wisconsin; Douglas Lake, Michigan; South Miami, Florida; West Point, Mississippi; Quemada, Texas; Huachuca, Arizona; and Wray, Colorado.

Flight records: Records from Florida and Texas indicate the species begins flying in March and continues until August. With the increase in latitude to the north and altitude to the southwest the emergences are retarded with the latest seasonal record as September 29 from a Carlinville, Illinois, specimen. The main flights occur during July, August, and early September.
Plant records: The bee principally visits members of the genus *Physalis* but is not oligotropic on that group. Records include: *Asclepias incarnata*, *Ceanothus americanus*, *Medicago sativa*, *Melilotus alba*, *Physalis lanceolata*, *P. virginiana*, *Polygonum hydropiper*, *Solidago*, and *Symphoricarpos occidentalis*.

Specimen number 8987, a female, bearing a "Type" label printed in red, is hereby designated lectotype, and a male, lacking a number and collection data but bearing a written "Type" label, is designated lectoallotype.

The lectotypes from Illinois are in the collection of the Illinois State Natural History Survey.

*Colletes punctipennis maurois* subsp. nov.

(Fig. 11)


This species was originally described by Cresson from specimens taken in Mexico south of Mexico City. An examination of the original description and of a male from Yucatan convinces me that Texas specimens exhibit sufficient differences to merit subspecific recognition. The pile of the face, mesothorax, and tibiae is strongly intermixed with black pile whereas *p. punctipennis* has no black hair in these areas. The prothoracic spines of *p. maurois* are shorter and more nearly triangular and the punctuation of the vertex is more distinct. Generally the pile of the body has a much greater intermixture of black in the Texas specimens, and the isolation of this subtropical area in the Brownsville region may restrict the dark population to a very small locale.

**Male:** length 11.5 mm., wing length 8.5 mm.

Pile of face predominantly long and white about antennal bases and along inner orbital margins; clypeus with a few, overhanging, long, pale grey to white hairs, a strong admixture of erect, black pile laterad and ventrad to antennal bases; vertex with pile black mixed among finer, pale grey pile; upper genal areas with pile short, pale grey, with a few dark intermixed hairs, pile becoming much longer, denser, and whiter below; mesoscutum with a very strong admixture of black and pale grey pile over entire surface; scutellum with pile predominantly black except for a weak peripheral fringe of white pile; mesepisterna with an admixture of black and pale grey pile above, pile becoming longer, finer, and whiter below; propodeum with a dense fringe of long, pale grey and black pile at upper lateroposterior surfaces, lateral and posterior faces with
pile shorter and whiter; pile of legs long and rather sparse with almost equal quantity of black and white pile intermixed; first metasomal tergum with apical fascia very weak and narrow, often interrupted medially, pile forming a weak white fringe, lateral fringes of pile weak, short, and white, barely reaching apical fascia, disc with sparse, erect, pale grey pile; metasomal terga two to four with fasciae very weak, narrow, and white, often interrupted medially; metasomal terga two to six with abundant, erect, black pile on discal areas; metasomal sterna with a weak covering of fine, dark pile, particularly on apical portions of each sternum.

Antennae long, yellowish brown below to deep brown-black above; malar spaces five-eighths as long as broad; clypeus with a deep longitudinal median sulus, most evident at central portion, surface very coarsely, striately punctate to apex, interspaces shiny; vertex dull, finely and densely punctate; fascial foveae distinctly depressed above, barely reaching to top of inner margin of compound eyes. Prothoracic spines roughly triangular, barely as long as width across base; mesoscutum very coarsely and densely punctate, almost contiguous anteriorly to one-half puncture width apart posteriorly, impunctate area absent; scutellum very densely and coarsely punctate to anterior margin, punctures contiguous and not at all striate; mesepisterna deeply, coarsely punctate, punctures one-half puncture width apart with shiny interspaces; propodeum with basal area deeply, longitudinally quadrate, lateral and posterior faces dull and roughened; tegulae deep brownish black; wings dusky with abundant, long, deep fulvous pubescence over entire surface, wings pictured, pictures extending posterior to the stigma and apically from radial sector to anteroapical margin, weakly pictured about apical ends of veins, median one and cubitus one; legs extremely robust, deep black; posterior basitarsi twice as long as broad. First metasomal tergum very densely and coarsely punctate, punctures one-half to one puncture width apart, interspaces shiny, a weak elevated median impunctate longitudinal ridge; second metasomal tergum with punctures slightly finer and denser than those of first tergum, not more than one-half puncture width apart, tergum abruptly depressed basally; apical fasciae of metasomal terga two to four lying in smooth, black, impunctate margins; metasomal sterna with apical portions finely folliculated, discal areas shiny; seventh ventral plates and capsule complex, much as in latitarsis (fig. 11).

Distribution: Holotype, male, Brownsville, Texas, July 3, 1938 (R. H. Beamer); paratypes, 3 males, Brownsville, Texas, October
16, 1908 (Mitchell and Bishop); Palm Forest, Brownsville, Texas, March 27, 1951 (R. H. Beamer); Brownsville, Texas, January 2 to 13, 1928.

The holotype is in the Snow Entomological Collections of the University of Kansas.

**Group IV—*simulans***

*Colletes simulans* Cresson

This species most closely resembles *fulgidus* Swenk, particularly in the western part of its range, where the females are at times barely distinguishable. The mountain representatives of *simulans* differ slightly from *fulgidus* in having the puncturation of the first metasomal tergum much closer and coarser; however, there are exceptions to this, and the only accurate method of determination is by genitalic examination of the males. The penis valves of *simulans* are broad, truncate apically, and the gonostyli are slightly more than four times as long as their apical width. In *fulgidus* the penis valves are weakly rounded and the gonostyli are three times as long as broad measured at the same position. The seventh ventral plates of *simulans* vary greatly in the regions between the western part of the Great Plains and California. Generally they are much broader and have long lateral basal projections near the basal hair tufts in the west and north. As Timberlake suggests, the trapezoidal shape of the seventh ventral plate is exaggerated in the Swenk illustration from California; however, the more northerly material from Wyoming, Montana, and British Columbia comes closer to that illustrated, suggesting there may be a north-south cline in this character rather than the east-west variability suggested by others. In addition to the puncturation of the first metasomal tergum, the females differ from *fulgidus* in having the precoxal spines approximately four times as long as broad, and the scutellum with many longitudinal striae over the posterior three-fourths of the surface.

**Male:** length 10 mm., wing length 7 mm.

Pile of face rather long and pale, concealing clypeus; pile of vertex and upper genal areas variable, becoming much longer, finer, and pure white below; mesoscutum and scutellum with abundant, long, erect pubescence, weakly tinged with ochreus and occasionally mixed with black pile on mesoscutel and scutellar discs; pile of mesepisterna long, fine, and light grey; propodeum with long, dense fringes of pale grey pile at lateroposterior margins, extending halfway down to pedicle, lateral and posterior faces sparsely covered
with erect, pale grey pile; legs with pile sparse, long, and white to pale grey; first metasomal tergum with apical fascia weak, rather narrow, and pale grey, lateral fringes of pile extending to the apical fascia, sometimes interrupted towards apex, discal area with abundant, long, erect, pale grey pile, not at all concealing surface; metasomal terga two to five with fasciae broad and white; metasomal sterna with very narrow apical fasciae of short, white pubescence.

Antennae long, deep reddish brown, flagellar segments approximatively one and one-half times as long as broad; malar spaces five-eighths as long as broad; clypeus weakly convex, finely and densely punctate over the basal one-half and down a median longitudinal line, punctures not at all striate, the apicolateral margins shiny, sparsely punctate with weak striate punctures; vertex dull, densely punctate. Prothoracic spines short and roughly triangular; mesoscutum densely, coarsely punctate over anterior one half and lateral margins; scutellum with discal area sparsely punctate with shiny interspaces, punctures approximately one to two puncture widths apart, becoming much sparser towards anterior margin; wings dusky, nervures brown; legs deep brown to black; posterior basitarsi four times as long as broad. Second metasomal tergum with a distinct basal depression; seventh ventral plates roughly quadrate, expanded or lobate towards the apical end, a long, lateral projection from the basal area of each plate; penis valves broadly truncate apically; gonostyli slightly more than four times as long as apical width.

**Female:** length 11.5 mm., wing length 8.25 mm.

Pile of face erect, sparse, and pale grey, concentrated principally about antennal bases; vertex with some dark pile intermixed; mesoscutum with dense fringes of light ochreus pile about anterior one fourth and lateral margins, discal area with abundant, black, erect pile; scutellum with a peripheral fringe of light ochreus pile, discal area with abundant, erect, black pile; mesepisterna with pile tinged with ochreus above, becoming much longer and whiter below; pile of legs long and tinged with ochreus; first metasomal tergum with a very narrow, weak apical fascia, evident only laterally, lateral fringes rather weak, evident only on anterior lateral face, not usually reaching apical fascia, discal area sparsely covered with a few pale grey hairs; metasomal terga two to five with fasciae broad and white, second metasomal tergum with distinct basal fascia of white pubescence; metasomal sterna two to four with very weak fringes of light ochreus pile, not at all fasciate.
Antennae reddish brown, flagellar segments approximately as long as broad; malar spaces one fourth as long as broad; clypeus weakly convex, very coarsely and striately punctate to apex, interspaces shiny; vertex finely punctate with shiny interspaces. Prothoracic spines long; mesoscutum very coarsely, densely, almost rugosely punctate over anterior one half and lateral margins, surface dull, impunctate area very small; scutellum rather densely and striately punctate, striae extending towards anterior margin, dull, striate punctures almost reaching anterior margin; mesepisterna very coarsely and densely punctate, punctures contiguous above, becoming slightly sparser below, dull; propodeum with basal area quadrately pitted, lateral faces shiny and weakly sculptured, posterior face dull and roughened; wings dusky with abundant, light ochreous pubescence apically, nervures brown; legs deep reddish brown; posterior basitarsi three times as long as broad. Metasomal sterna shiny, finely and sparsely folliculated.

It is difficult to separate the subspecies of simulans on the basis of the named forms. The division into the four subspecies which follows is not entirely satisfactory since simulans was originally described from specimens labeled merely “Colorado” and exhibiting features intermediate between two of the subspecies. I believe the typical material to be most characteristic of the Rocky Mountain subspecies and therefore have recognized simulans simulans as the form occurring in the mountainous regions from Arizona and New Mexico north into Montana. A rather good representation of this subspecies from the mountains of Arizona and western New Mexico has the mesoscutum devoid of any dark hairs and the seventh ventral plates more strongly lobate than in those specimens occurring in the northern portion of the Great Divide. Specimens from Zion National Park in southern Utah are basically similar to the Arizona material but in northern Utah, Nevada, and western Colorado the dark hair of the mesoscutum becomes more prominent and the seventh ventral plates much more trapezoidal. This increase in the amount of black pile and the more trapezoidal shape of the seventh ventral plates progresses to the north, with the plates becoming widest in specimens taken from the valleys of Washington and British Columbia. The females taken in Arizona exhibit a marked difference from other populations of this species in having the prothoracic spines roughly triangular and strongly tending towards obliqueness. The first metasomal tergum of s. simulans is much more coarsely punctate than the others and the pile of the scutellum and the mesoscutum is predominantly ochreus to ochreus
grey. The oblique nature of the prothoracic spines is found in much of the material taken in Colorado, particularly in specimens from the higher altitudes between 4000 and 9000 feet, and this tendency is also evident in some of the southern Utah specimens.

The obliqueness of the prothoracic spines is lost in *s. nevadensis* occurring in California, Oregon, Washington, and British Columbia, where the spines are long and sharp.

The more northerly material found from the foothill regions east of the Continental Divide to the Atlantic seaboard I have considered as mostly *armatus* Patton, with *s. miamiensis* or intergrades toward it occurring in the extreme south. Two males from El Paso, Texas, are intermediate between *s. simulans* and *s. miamiensis* genitalically but differ from *s. simulans* in having much less dark hair on the mesoscutum and scutellum; in fact there are only a few darker hairs intermixed on the scutellar disc. Several specimens representing both sexes have been taken at Hattiesburg, Mississippi, and prove to be an intermediate form between those from El Paso and those from Florida, *s. miamiensis* Mitchell.

Were it not for the abundance of black pile on the thoracic dorsum and the long, sharp prothoracic spines of the eastern *armatus*, this subspecies would be very difficult to distinguish from the populations of *s. simulans* occupying the Arizona-New Mexico plateaus. In the material taken from the foothill regions of Texas, Nebraska, and the Dakotas, the prothoracic spines lose the oblique nature of *s. simulans* completely and become much longer and sharper. Accompanying this elongation of the spines there is a progressive increase in the amount of black pile on the mesoscutum, scutellum, and the vertex of the head, reaching a stage of almost completely black along the Atlantic seaboard. Here, too, the prothoracic spines reach their greatest length, extending laterally well out beyond the edges of the head.

Thus examination of the two sexes suggests that the entire group may have spread from the southwestern area and moved north, west, and east to occupy North America. The absence of any closely related species in the Palearctic region (Noskiewicz, 1936) tends to substantiate the southerly origin of this complex. (Map 1.)

*Colletes simulans simulans* Cresson

(Fig. 12)


The males of this subspecies have the pile of the mesoscutum and scutellum pale grey or tinged with light ochreus and a few dark hairs intermixed, these dark hairs not black. The tegulae and the nervures are a light hyaline brown. The first metasomal tergum is very densely and coarsely punctate with the punctures no more than one puncture width apart. The seventh ventral plates are roughly quadrate tending to weakly trapezoidal in the mountains of the Central States (fig. 12). The females have the prothoracic spines rather long and tending towards obliqueness apically, becoming much shorter and tending to be much more oblique in the mountains of New Mexico and Arizona, which at present is the southern known extremity of its range. The first metasomal tergum is very densely punctate, punctures no more than one puncture width apart.

Distribution: This subspecies ranges from Montana southward into the mountains of New Mexico and Arizona. It has been recorded from: Montana: Bozeman; Weeksville. Wyoming: Rock Springs; the mountains near Sheridan. Colorado: Creede; Glenwood Springs; Greeley; San Luis Valley; Wray. New Mexico: Albuquerque; Las Cruces; Sacramento Mountains; Mescalero; San Ignacio; Willow Creek. Arizona: Flagstaff; Grand Canyon; House-rock Valley; Humphrey's Peak; Oak Creek Canyon; Sabino Basin; Santa Catalina Mountains; San Pedro River, Fairbanks.

Flight records: Specimens have been caught during the period August 2 to September 23.

Flower records: Aster, Bigelovia Wrightii, Grindelia, Senecio.

The holotype of simulans from Colorado is in the Academy of
Natural Sciences of Philadelphia, that of *bigeloviae* from Mescalero, New Mexico, is in the United States National Museum, that of *brevispinosus* from Beulah, New Mexico, is in the collections of the Academy of Natural Sciences of Philadelphia, and that of *tegularis* from Gering, Scotts Bluff County, Nebraska, is at the University of Nebraska.

*Colletes simulans miamiensis* Mitchell


The subspecies, although found far from the Continental Divide, agrees more closely with *s. simulans* than *s. armatus*, but ranks as subspecifically distinct on the basis of few dark hairs on the thoracic dorsum, weakly truncate and short prothoracic spines, and denser pubescent covering of the wings. The seventh ventral plates resemble those of *s. simulans* in their shorter laterobasal projections and broad basal areas.

The suggested relationship to *s. simulans* is enhanced by the presence of intermediate forms from Hattiesburg, Mississippi, and El Paso, Texas, and the apparent absence of the species in the East South Central States.

On the basis of these data it appears that the Florida specimen represents the eastern terminus of an east-west cline extending through Texas and the southern states.

This monotype was examined only once and unfortunately returned before an adequate description was compiled. To supplement the notes made at the time of examination, the original description follows.

"Male—Length 9 mm.; length and breadth of face subequal; eyes convergent below; length of malar space about one-third its breadth; length of antennal segments about 1½ times their breadth, basal segment of flagellum much shorter than the second, flagellum brownish, but the basal segment much darker; clypeus closely and deeply punctate, upper portion hidden by the dense pubescence; face above antennae dull, rugoso-punctate, vertex shining, finely and irregularly punctured; cheeks closely and finely punctate beneath the copious pubescence; pubescence whitish on head and thorax, slightly yellowish above, mesonotum and scutellum with a few inconspicuous, fuscous hairs; lateral angles of prothorax not spinèd; metapleural protuberance not carinate; legs dark, metatarsi slender; spurs yellowish; tegulae yellowish-ferruginous; wings lightly infuscated, nervures and stigma piceous; third submarginal cell slightly
exceeding the second, the latter receiving first recurrent slightly basad of middle, third receiving second recurrent about one-third from tip; punctures of mesonotum deep and coarse, close over most of disc, but sparse in center of posterior half; scutellum shining, coarsely and deeply punctate, anterior margin impunctate, but punctures quite close along hind margin; pleura dull, rugoso-punctate anteriorly and above, with more distinct but close and coarse punctures below; lateral and posterior faces of propodeum coarsely reticulate, dorsal face short, with closely parallel striae; base of abdomen deeply and distinctly but finely punctate, punctures well separated but not sparse; second and following terga becoming successively more minutely and closely punctate; apical margins of terga slightly depressed, reddish-hyaline beneath the thin, white fasciae, discal pubescence on second and following terga fuscous, very short, suberect and inconspicuous; seventh sternum and genital armature essentially the same as in the other forms of simulans.


Colletes simulans armatus Patton

(Fig. 14)


The Swenk (1908) synonymy in which he lists bigeloviae and brevispinosus as armatus is in error and as Timberlake (1943) suggests they are synonyms for the better known simulans simulans.

The males have black hair intermixed on the vertex, mesoscutum,
and scutellum. The prothoracic spines are long and sharp, approximately one and one-half times as long as the width across the base. The mesepisterna are obscurely punctate and roughened, and the first metasomal tergum is very finely punctate, with punctures two to three puncture widths apart. In many specimens there is an admixture of black pile along the lower inner orbital margins. The seventh ventral plates are particularly quadrate and lobate apically (Figure 14).

In the females the pile of the vertex, the mesoscutum, and the scutellum is predominantly black. The prothoracic spines are very long and sharp, protruding well beyond the sides of the head; the fascial foveae are deep and shiny; the tegulae are deep brown, almost black; the scutellum is more striate than punctate to the anterior margin; and the mesepisterna are more coarsely punctate.

**Distribution:** This species is found in abundance throughout the northern Great Plains to the Atlantic seaboard, recorded southward to North Carolina. Marginal localities include King's County, Nova Scotia; Fort Coulange, Quebec; Aweme, Manitoba; Bilby, Alberta; Malcolm, Nebraska; and Raleigh, North Carolina.

**Flight records:** The subspecies flies from August 2 until October 1.

**Plant records:** *Aster, Solidago, Solidago nemoralis.*

A female, Pelham, N. H., September 2, 1905 (Bridwell) and a male, Nelson, N. H., August 1, 1907, are hereby designated neotype and neallotype of *armatus*. Both are in the collections of the United States National Museum. A female, number 9697, and a male, number 6876, both from Illinois, are hereby designated lectotype and lectoallotype of *spinosus*, and are in the Illinois Natural History Survey Collections.

*Colletes simulans nevadensis* Swenk

(Fig. 13)

*Colletes nevadensis* Swenk, 1908, Univ. Nebraska Studies, vol. 8, p. 52.

The male has the pile of the face, the thorax, and the abdomen weakly tinged with light yellow, the pubescence, particularly the fasciae, is denser and the fasciae somewhat broader. The prothoracic spines are slightly longer than the width across the base. The seventh ventral plates are trapezoidal in shape, much more so than the quadrate form from the southwestern mountains (Fig. 13). The malar spaces are slightly reduced, being scarcely half as long as wide.
The female has the pile of the body weakly tinged with yellow. The malar spaces are slightly reduced. The prothoracic spines are long and sharp, protruding to the edge of the head. The first metasomal tergum has the punctures finer and slightly sparser, ranging from two to three puncture widths apart.

**Distribution:** The subspecies is found in the lowland areas of Utah, Nevada, California, Washington, Oregon, and British Columbia. It undoubtedly occurs in the valleys of Idaho and possibly western Colorado but has not yet been taken there. Peripheral localities include: Penticton and Oliver in British Columbia, Riverside and Los Angeles Counties, in California, and Salt Lake City and Emery County in Utah.

**Flight records:** Flight records are from August 7 until November 26. A great number of specimens determined as *nevadensis* taken particularly from the mountains of California have proved to be *fulgidus* Swenk. I believe *simulans nevadensis* to occur only in the lowland areas, being replaced by *fulgidus* in the mountains.

**Plant records:** *Baccharis emoryi*, *Chrysothamnus*, *Ericameria ericoides*, *Eriogonum*, *Gutierrezia californica*, *Aplopappus* (Isocoma) *veneta* var. *vernonioides*, *Lepidospartum*, *Melilotus alba*.

The holotype from Reno, Nevada, is in the collections of the University of Nebraska.

**Colletes angelicus** Cockerell

(Fig. 15)


Both sexes of this species can readily be distinguished by having the prothoracic spines obliquely truncate and by having their posterior margins protruding to or beyond the anterior. It most closely resembles *fulgidus* Swenk. Criddle *et al.* reported *angelicus* from British Columbia in 1924. I doubt the validity of this determination although to my knowledge I do not have their specimen before me. The species seems to be restricted to southern California where it appears to replace *fulgidus*. The male genitalia closely resemble those of *fulgidus* except for minor differences in the hair pattern. Some variation exists in the presence of black pile on the mesoscutum and scutellum. In all specimens having a deep ochreus pile on the thoracic dorsum dark hairs are evident; however in those having the pile grey, dark hairs are not discernible. This would seem to indicate that the dark pile is deep ochreus rather than black.
In the majority of the males the sternal fasciae are continuous, however in a few the fasciae are interrupted medially. The female can be readily separated from other members of the simulans group on the basis of the prothoracic spine peculiarity and the very long procoxal spines.

**Male:** length 11 mm., wing length 7.5 mm.

Pile of face dense and long, tinged with yellow, completely concealing clypeus and extending just slightly above antennal bases; pile of vertex and upper genal areas pale grey, pile becoming much longer and whiter below; mesoscutum with abundant, long, erect pile slightly tinged with ochreus, a few darker hairs on discal area of the mesoscutum; scutellum with pile principally pale grey to light to tinged with yellow, having a few dark, almost black, hairs intermixed; mesepisterna with pile long, fine, and pale grey; propodeum with dense lateroposterior fringes of pale grey pile, lateral and posterior faces with abundant, erect, pale grey pile; legs with pile sparse, short and light; first metasomal tergum with fascia weakly tinged with yellow and complete with rather long hairs, lateral fringes pale grey, extending to the fascia, disc with abundant, erect, pale grey pile; metasomal terga two to five with fasciae much broader than first and much more white, fasciae very dense; terga three to six with discs having abundant, erect, light pile, not black; metasomal sterna with fasciae uniform and complete with a dense apical fringe.

Antennae deep brown to black, flagellar segments approximately one and one-half times as long as broad; malar spaces three-fourths as long as broad; clypeus weakly convex, rather finely and densely punctate over apical one half and down median portion, lateral apical aspects sparsely, striately punctate with shiny interspaces; the vertex finely and densely punctate, dull. Prothoracic spines obliquely truncate with posterior margin descending beyond anterior; mesoscutum densely punctate, impunctate area very small; scutellum densely, coarsely, almost rugosely punctate over posterior one-third, punctures becoming sparser with shiny interspaces over median portion, anterior face shiny, impunctate; mesepisterna densely punctate, punctures no more than one-half puncture width apart; propodeum with basal area deeply, quadrately pitted, lateral and posterior faces dull and roughened; tegulae brown; wings with very sparse, light ochreus pubescence tending to be almost whitish hyaline basally, nervures brown; legs reddish brown to black; posterior basitarsi four and one-half times as long as broad. First metasomal tergum densely punctate with punctures one to two
puncture widths apart; second metasomal tergum with punctures finer and denser, no more than one puncture width apart, tergum having an abrupt basal depression; metasomal terga one to four with fasciae lying in broad, depressed apical margins, these depressed margins light brownish hyaline; sterna shiny, rather weakly and sparsely folliculated; the seventh ventral plates resemble *fulgidus* but much narrower and more elongate (fig. 15).

**Female:** length 11 mm., wing length 8 mm.

Pile of face erect and pale grey, clumped principally about antennal bases; vertex with pile tinged with ochreus, pile becoming longer and pale grey below; mesoscutum with pile pale grey to light ochreus intermixed with abundant black pile on discal area; scutellum with an admixture of light ochreus and black pile about peripheral margins; mesepisterna with pile long, fine, and pale grey; propodeum with dense fringes of pile along lateroposterior margins extending down towards pedicel, lateral and posterior faces with abundant, erect, pale grey pile; pile of legs light ochreus, long, and dense; first metasomal tergum with apical fasciae weak and narrow, easily removed, lateral fringes of light ochreus pile extending to fascia, discal area with scattered, pale grey pile, particularly on anterior face; metasomal terga two to five with fasciae broad and rather dense, second metasomal tergum with a broad basal fascia; terga three to six with the discs having scattered, ochreus to deep testaceeous, erect pile, not at all concealing surface; metasomal sterna two to five with weak lateral clumps of pile, not continuous through middle.

Antennae reddish brown, flagellar segments seven-eighths as long as broad; malar spaces three-eighths as long as broad; clypeus weakly convex, densely, striately punctate to the apex; fascial foveae greatly broadened above and deep, extending over half way to lateral ocelli; vertex shiny with many fine punctures. Prothoracic spines obliquely truncate with posterior margin descending beyond anterior; mesoscutum very coarsely almost contiguously punctate on median area, impunctate area very small; scutellum very coarsely and densely punctate over posterior one half, anterior half with punctures sparse and almost absent, a deep median longitudinal sulcus extending almost to anterior margin; mesepisterna dull and very coarsely and contiguously punctate; tegulae deep brown; wings dusky with sparse, ochreus pubescence, nervures brown; legs deep reddish brown to black; posterior basitarsi four times as long as broad. First metasomal tergum rather densely punctate with fine punctures, punctures approximately one to two puncture widths
apart; second tergum with punctures very fine, folliclelike, and dense, apical fasciae in weakly depressed margins, fascial depressions hyaline; metasomal sterna sparsely folliculated with rather coarse follicles.

**Distribution:** California: Antioch; Contra Costa County; Berkeley; Riverside; Anaheim, Orange County; Morro Bay; Los Angeles.

**Flight records:** The species has been caught in abundance between August 21 and October 25 in southern and central California. However, I have two specimens from Berkeley, California, which were collected on April 20, 1937. This would indicate that the species has two generations or probably one and a partial spring generation.

**Plant records:** *Eriogonum, Hemizonia paniculata, Isocoma vernonioides.*

The holotype from California is in the collections of the Citrus Experiment Station, Riverside, California.

*Colletes fulgidus fulgidus* Swenk

(Fig. 16)


This species ranges from California and Nevada across the southern Great Basin to the Rocky Mountains. Swenk recorded the species from Nebraska and Texas as well as other northern and far western states. I have not seen any specimens from either Nebraska or Texas other than a few females determined as *fulgidus* by him. These specimens are *louisae* Cockerell and *simulans simulans*. No males have as yet been taken from Nebraska, New Mexico, or Texas, where it is probably replaced by the more southerly *louisae*. The males of the species are difficult to distinguish without genitalic examination and even then a series of characters is necessary for accurate determination. This sex often shows considerable variation from the typical series, having the color of the thoracic pile varying from pale grey to light ochreus. The thoracic spines are rather blunt in some but rather long and sharp in others. A very few specimens lack dark pile on the mesoscutum and the scutellum, and in some there is a weak rudiment of a basal fascia on the second metasomal tergum. The females are difficult to segregate with certainty from *louisae* and some specimens show the first metasomal tergum rather coarsely punctate, bearing a close superficial resemblance to the *simulans* complex. While the typical material from
the Big Horn Mountains of Wyoming has an almost impunctate or weakly folliculated first tergum, other specimens from the western part of America show rather coarse but sparse puncturation. The second metasomal tergum, unlike that of *louisae*, is finely and densely folliculated. Similarly, the apical sterna of *fulgidus* are uniformly, finely folliculated, while the sterna of *louisae* have sparse, fine punctures restricted to the lateral and the extreme posterior surfaces.

**Male**: length 9 mm., wing length 6.5 mm.

Pile of face long, white, concealing clypeus and antennal basal area; vertex with pile light tinged with pale grey; upper genal areas with pile long and pale grey, becoming longer and more white below; mesoscutum with pile tinged with grey, long, erect, and fine; scutellum with pile pale grey to tinged with ochreus, a few darker hairs intermixed; mesepisterna with pile long, fine, and white; propodeum with weak fringes of long, pale grey pile on latero-posterior margins, lateral and posterior faces with a sparse covering of long, erect, pale grey pile; pile of legs very sparse, fine, and whitish; first metasomal tergum with apical fasciae narrow, composed of long, ragged, pale grey pubescence, lateral fringes of pale grey pile weak extending to apical fascia, discal area with abundant, erect, long, pale grey pile; metasomal terga two to five with fasciae composed of weak, ragged, white pubescence, discal areas of terga three to six with abundant, short, ochreus to grey pile, not at all concealing surface; metasomal sterna with apical fringes of short, white pile, slightly longer at extreme lateral margins.

Antennae reddish brown, flagellar segments one and one-fourth times as long as broad; malar spaces three fourths as long as broad; clypeus convex, finely and densely punctate over basal one half and down a flattened, median longitudinal line, not rugosely punctate, apicolateral faces shiny, impunctate; vertex distinctly punctate with shiny interspaces. Prothoracic spines long and sharp, about one and one-half times as long as width across base; mesoscutum rather finely punctate, punctures approximately one puncture width apart on anterior and lateral faces, becoming sparser in median discal area; scutellum coarsely punctate, punctures approximately one puncture width apart medially, becoming much sparser toward anterior face; mesepisterna rather finely punctate, punctures approximately one puncture width apart above to one and a half puncture widths below, interspaces shiny; propodeum with basal area deeply pitted, lateral and posterior faces dull and roughened; tegulae dark brown hyaline; wings dusky, nervures brown; legs
deep reddish brown; posterior basitarsi four and a half times as long as broad. First metasomal tergum deeply punctate with punctures one to two puncture widths apart, interspaces shiny; second metasomal tergum with punctures finer and closer, especially on anterior margin, tergum distinctly depressed basally; metasomal sterna shiny and sparsely folliculated on lateroposterior one half of each sternum; seventh ventral plates as illustrated (fig. 16).

Female: length 10.5 mm., wing length 7 mm.

Pile of face long, white and dense about antennal bases and middle inner orbital margins, a few long hairs overhanging clypeus; vertex with a few, light ochreus hairs, particularly in and about the ocellar triangle; upper genal areas with pile tinged with grey, becoming very fine and much longer below; mesoscutum with pile light ochreus about anterior and lateral margins, discal area with pile black; scutellum with a peripheral rim of pile tinged with ochreus, disc with abundant black pile; mesepisterna with pile long, fine and pale grey; legs with pile short, rather dense on posterior legs, and tinged with ochreus; first metasomal tergum with apical fascia weak, interrupted medially and evident only as a fascia at lateral one third, lateral fringes of pile dense, extending to apical fascia, discal area sparsely covered with erect, fine, pale grey pile; metasomal terga two to five with fasciae very broad, dense, and pure white, second metasomal tergum with a basal fascia interrupted medially; metasomal sterna with a few erect, pale grey hairs, not forming a fascia.

Antennae reddish brown, flagellar segments about as long as wide; malar spaces one-third as long as broad; clypeus flattened medially, coarsely, striately punctate to the apex, ridges and interspaces shiny; vertex shiny with a few scattered punctures. Pro-thoracic spines long, about twice as long as width across base, extending laterally to sides of the head; mesoscutum very densely and coarsely punctate over anterior one-half and lateral margins, impunctate area large; scutellum densely punctate about lateral and posterior faces, discal area sparsely and finely punctate with punctures anywhere from one to three puncture widths apart, anterior one-third shiny, impunctate; mesepisterna very densely, almost contiguously punctate; propodeum with deep, broad, quadrate pits, propodeum with lateral and posterior faces weakly rugose and shiny; tegulae deep brownish hyaline; wings dusky, nervures brown; legs deep brown; posterior basitarsi three and one-half times as long as broad. First metasomal tergum shiny, very weakly and sparsely punctate, punctures most dense laterally where they are
three to four puncture widths apart; second tergum shiny and sparsely folliculated; metasomal sterna densely folliculated over posterior one half of each sternum.

Distribution: The species is found in abundance in the higher regions of California, Oregon, Washington, Idaho, Montana, Wyoming, northern Utah, and Colorado, circumscribing the Great Basin region. Marginal localities are: Tonopah, Nevada; Bear Valley, San Bernardino County, California; Salmon Arm, British Columbia; Lethbridge, Alberta; Craters of the Moon, Idaho; Missoula, Montana; Custer, South Dakota; Aspen, Colorado; and Vernal, Utah.

Flight records: The species flies from May 7 until October 16, occurring in abundance during all the summer months.

Plant records: Chaenactis sterioides, Clarkia, Encelia, Eriogonum, Grindelia, Isocoma vernonioides, Medicago sativa, Melilotus alba, Salix, Solidago.

The holotype from the Big Horn Mountains, Wyoming, is in the collections of the University of Nebraska.

*Colletes fulgidus longiplumosus* sp. nov.

This subspecies formerly was included with *fulgidus fulgidus*; however it is readily distinguished in both sexes by the extremely long and dense pile of the head, thorax, and abdomen. The subspecies appears to be a coastal race of the generally montane *f. fulgidus* and has been collected from various localities along the Californian coast. The male differs from *f. fulgidus* in having the malar spaces as long as wide, the prothoracic spines vestigial, almost absent, the punctuation of the first metasomal tergum finer and sparser and the pile of the body very long, dense, and plumose. The black pile is evident on the scutellum and the mesoscutum. In the females of this subspecies the malar spaces are approximately one-half as long as broad; the prothoracic spines are roughly triangular and obtuse; and the pile, principally of the head and thorax is exceedingly long and plumose.

Distribution: The extreme western coastal region of California from Humboldt County to San Luis Obispo County, inland as far as Sacramento.

Holotype male, allotype female and 9 paratypes: Montara, San Mateo County, California, June 10, 1939 (C. D. Michener); paratypes: 27 males, Dillon Beach, Marin County, California, May 22, 1949 (W. W. Middlekauff); 1 male, San Francisco, California, May 21, 1911 (J. A. Kusche); 2 females, Sacramento, California, June 26,