A REVISION OF NORTH AMERICAN BEES OF THE SUBGENUS CNEMIDANDRENA (Hymenoptera: Andrenidae)

BY
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INTRODUCTION

More than 1,200 species of the Holarctic bee genus *Andrena* Fabricius have been described. Most of these have been allocated to approximately 50 subgenera. The taxonomic history and systematics of species in *Andrena* have been discussed and revised by a number of workers but will be briefly reviewed here to place the present work in perspective. Hedicke (1933), in a major study of the Palearctic species, placed many in 22 subgenera, but his subgeneric descriptions were brief. Lanham (1949) and LaBerge (1964), working with Nearctic species, defined 31 and 34 subgenera, respectively. Lanham found that 8 of the subgenera proposed or defined by Hedicke for the Palearctic *Andrena* could be satisfactorily applied to the New World fauna. One of these is *Cnemidandrena.*

Recently there have been 8 major revisions of 16 subgenera of *Andrena* which occur in the New World. These include: *Callandrena* Cockerell (LaBerge, 1967), *Micrandrena* Ashmead and *Derandrena* Ribble (Ribble, 1968), *Diandrena* Cockerell (Thorp, 1969), *Plastandrena* Hedicke, *Aporandrena* Lanham, and *Charitandrena* Hedicke (LaBerge, 1969), *Tylandrena* LaBerge (LaBerge and Bouseman, 1970), *Scrapteropsis* Viereck, *Xiphandrena* LaBerge, and *Rhaphandrena* LaBerge (LaBerge, 1971), *Gonandrena* Viereck, *Geissandrena* LaBerge and Ribble, *Parandrena* Robertson, and *Pelicandrena* LaBerge and Ribble (LaBerge and Ribble, 1972), and finally *Trachandrena* Robertson (LaBerge, 1973). In addition, the subgenus *Belandrena* was described by Ribble (1968) and the subgenus *Nemandrena* by LaBerge (1971).

For *Andrena* of the western Paleactic region, Warncke (1968) provided a key and descriptions for 51 subgenera, and listed species belonging to each subgenus. Five species were listed in *Cnemidandrena.*

The following study of *Cnemidandrena,* while primarily a systematic revision of the New World species, includes a brief discussion of the relationships of some of the New World representatives with those of the Old World.

To date, 32 specific and subspecific names have been included in North American *Cnemidandrena.* In the following pages, one name is added from *Leucandrena* Hedicke, one name is transferred to *Geandrena* LaBerge, and four names are removed with affinities uncertain. Of the remaining 28 names, 2 were preoccupied and 5 were placed in synonymy by earlier workers. In the accounting here, 5 additional names are regarded as junior synonyms, and to the remaining 16 valid names, 10 new ones are added, which gives a total of 26 species of North American *Cnemidandrena.* A total of 4,485 specimens was studied.

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PREVIOUS CLASSIFICATIONS

In the first subgeneric classification of *Andrena,* Perez (1890) used 6 subgeneric names, and in *Hoplandrena* Perez, listed 3 species (among 23 others) now placed in the Old World representatives of *Cnemidandrena.* Perez did not designate types or provide descriptions for his subgenera. Perkins (1919) divided the British species of *Andrena* into groups, one of which he called the Nigriceps group, and within which he placed five names, all now in *Cnemidandrena.* Characters for each group were discussed. Stockhert (1930) listed 173 species of European *Andrena* and assigned seven names to the Nigriceps group.

The subgenus *Cnemidandrena* was described by Hedicke (1933) with *Andrena nigriceps* Kirby designated as the type species, and 11 other names, all of Old World species, listed as belonging to the subgenus. Characters of both males and females were briefly described.

In the New World, Robertson (1902) divided *Andrena* into seven genera and assigned *A. nubecula* to the genus *Andrena,* but pointed out that all these *Andrena* species were vernal except *A. nubecula.* The first New World species of *Cnemidandrena* were described by Smith (1853), but most were described by Cockerell and/or Viereck in papers published between 1897 and 1937. Other species were described or named by Provancher (1888), Dalla Torre (1896), and Graenicher (1904). Cockerell (1931) discussed and recorded bees of the Rocky Mountains, and in a key separated the females of 13 species which fly in late summer and autumn, 8 of which were names later listed in *Cnemidandrena* by Lanham (1949). However, Cockerell did not recognize these species as belonging to one systematic group. Lanham (1949) was the first to apply the subgenus *Cnemidandrena* to bees of the New World, and he listed 23 species and 4 subspecies in this taxon with 3 other species provisionally assigned to it. Mitchell (1960) redescribed four species from the eastern United States and described and provisionally assigned one new species to *Cnemidandrena.* LaBerge (1964) revised the concepts of North American subgenera, but did not list species within the subgenera.

In Japan, Hirashima (1964) broadened the concept of *Cnemidandrena* to include forms with black hairs dorsally on the mesosoma, and for the first time described two representative species from Japan. Subsequently, he described a third species from Japan (Hirashima, 1966). LaBerge (1967) in his revision of *Callandrena* removed *scutellinitens* to *Cnemidandrena.*

Thus from the Old World 15 published names and for the New World 32 published names have been assigned to the subgenus *Cnemidandrena.* LaBerge (*pers. comm.*) applies three more names to the subgenus from specimens he studied in the British Museum (Natural History) of which at least two are from Siberia. Warncke (*pers. comm.*) knows of five species and two subspecies for the western Palearctic region.

The number of species present in the vast eastern regions of Russia and China is unknown. In North America more than half the species occur in the Great Basin region of the western United States, and the subgenus is represented in most areas of North America except the very cold north and the hot, humid, low-lying southeastern United States. Most species of *Cnemidandrena* apparently prefer a hot, dry climate, but some are found in moister, cooler climates. These broad physiological tolerances allow for a wide variety of habitats. This suggests that much of the eastern Palearctic region could support *Cnemidandrena,* and probably more species will be found there than are at present known from North America.

BIOLOGY

Little is known of the biology of *Cnemidandrena,* but from data on species within other subgenera of *Andrena,* females may be assumed to be solitary; and, judging by collection data, there is only one generation a year.

Nesting Behavior

Only two notes have been published on the nests of *Cnemidandrena.* Hicks (1926) quoted Mr. Clarence P. Custer who took *Andrena apacheorum* near Brainerd Lake,

Boulder Co., Colorado, on July 26, 1925: "Burrow vertical for 4 inches (10 cm), then almost horizontal for about 5 inches (12.5 cm) along the side of a rock. The bee was fairly well loaded with pollen before entering the nest." Knerer and Atwood (1964) found nests of *A. canadensis* in Ontario in a shaded footpath among burrows of *A. nivalis* Smith, (*Gymnandrena* Hedicke); nests of *A. nubecula* and *A. canadensis* were intermixed, and bees were nesting gregariously, in a sandy slope.

During the fall of 1967 and 1968, attempts were made to locate *Cnemidandrena* individuals and their nests in the field for the study reported here. These were not successful, but on August 24, 1968, at Boca Dam, Nevada Co., California, I captured two females and one male of *A. surda* flying near *Solidago* sp. These were brought to the laboratory where conditions simulating those in the field were prepared in the hope of inducing nesting behavior. However, after three days there was no evidence of nest construction; the male disappeared and the females died.

Andrena luteihirta females were found in very small numbers in 1967 (1 to 4 individuals on 3 of about 10 visits) at Antioch, Contra Costa Co., California, in an abandoned quarry on the south bank of the Sacramento River. The substrate was sandy with many exposed flat and vertical areas. The dominant vegetation on the floor of the quarry (approx. 1 ha) was yellow star thistle, *Centaurea solstitialis* L. with scattered stands of *Heterotheca grandiflora* Nuttall and nine small to medium-sized plants of *Grindelia camporum* Greene. A dirt road down to the quarry floor was edged with *Senecio douglasii* DC. Despite intensive searches, nests were not located.

On September 2, 1968, 12 females of *A. luteihirta* were caught, 10 on flowers of *Grindelia camporum* and 2 on flowers of *Senecio douglasii;* 5 of the females of *G. camporum* were collecting pollen and all other females were without pollen. As before, attempts to retain the specimens in captivity to learn their nesting habits were unsuccessful.

On September 7, 1968, another five females were captured at Antioch on *Grindelia camporum* and taken to Davis. At 8:00 pm that night, after the sun had set, in an attempt to simulate nesting behavior, the bees were "planted" in the cage in small holes about 2.5 cm deep and the top of each hole was lightly blocked with soil. The following morning at 8:30 am two females were observed flying against the side of the cage toward the sun and they were dead by late afternoon. The other three females had left their holes but were not located. Again there was no sign of nesting behavior.

One female of *A. surda* taken at Carson Pass, Alpine Co., on July 23, 1969, collecting pollen on *Grindelia* sp., was dissected. There were 3 ovarioles on each side, with about 43 eggs in various stages of development. The largest egg (Fig. 1) was 2.97 mm long, 0.72 mm wide throughout and curved with the ends rounded. The next largest egg was less than half this size.

Seasonal Flight

Individuals of *Cnemidandrena* fly in late summer and fall, with most collections in late July, August, and September. Excluding doubtful records, of 25 species of females, first and last collection dates peak at 11 in July (range May to September), and 10 in October (range June to November), respectively. For 23 species of males, first and last collection dates peak at 12 in July (range May to September), and 10 in August (range July to October) respectively.

Twelve species have fewer than 50 specimens, and collection dates for these species are rare, but for those species with more than 50 specimens, certain differences in seasonal

flight patterns can be distinguished. The first collection date for females of *A. citrinihirta* taken on September 10, occurred after the last collection date for females of *A. apacheorum, A. bocensis, A. costillensis,* and *A. scutellinitens. A. aurihirta,* which is closely related to *A. citrinihirta,* was first collected on August 18, but is the only species to be taken in November. These two California species have different distributions; *A. citrinihirta* occurs primarily in the Central Valley and *A. aurihirta* occurs chiefly in southern California. In these areas of California, mild fall weather is more prolonged than in other areas of North America where *Cnemidandrena* are found, except in the southwestern United States and northern Mexico. Females of *A. luteihirta,* the range of which extends over the combined range of *A. aurihirta* and *A. citrinihirta,* have been taken from July (no date given) to October 23, but there is only one record for July and 11 for August, with most females flying in September. *A. grindeliae,* the only other species found within the range of *A. citrinihirta,* is represented by 10 females and these were collected from September 6 to October 21.

Of the 14 species with more than 50 specimens, females have been taken before males in 9 species, on the same date as males in 2 species, and after males in 3 species. The last females taken have been after males in 13 species, and before males in one species. While there is little evidence for protandry from the data at hand, it is clear that in the field females are found later than males in almost all species.

Species of *Cnemidandrena* have infrequently been taken in large series. The largest numbers from one area in the material at hand have been 89 females and 51 males of *A. columbiana* from Nahcotta, Pacific Co., Washington, from June 15 to August 1 between 1935 and 1952 inclusive, and 141 females and 112 males of *A. aurihirta* taken at Riverside, Riverside Co., and the Santa Ana River, San Bernardino Co., California, from August 31 to November 6, between 1926 and 1952. Most other collections for various species range between 1 to 25 individuals, with the average for each collection about 3 or 4. The largest single collection was of 1 female and 37 males of *A. colletina* from Gazelle, Siskiyou Co., California, on September 11, 1950. It therefore seems that population density is low throughout the range of most species.

Flower Relationships

Pollen-collecting records are available for 23 species of *Cnemidandrena.* Females of 22 species collect pollen from Compositae, and of these, 20 species have pollen collection records from genera within the Astereae, with few records from other tribes or families. One species is unique; *A. mentzeliae* has been recorded only from *Mentzelia* and *Touterea* in the Loasaceae (*Touterea* is synonymized under *Mentzelia* by some authorities), a biological character which parallels its morphological uniqueness within *Cnemidandrena.* These data are summarized in the Appendix.

In the systematic section, flower records for females are summarized for each species, and the type of visit is indicated thus: P = Pollen; N = Nectar. Label records and published records were checked where possible, by examination of specimens. Bees recorded on flowers but without pollen in their scopae were presumed to be taking nectar.

Parasites

Eleven species of *Cnemidandrena* were found to have small numbers of stylopized individuals. Total numbers of bees examined are in parentheses. *A. apacheorum* 1 female (89); *A. aurihirta* 2 males (278); *A. canadensis* 1 female (428); *A. columbiana* 1 female

(526); *A. costillensis* 3 females (73); *A. hirticincta* 12 females, 6 males (699); *A. mentzeliae* 1 female (27); *A. nubecula* 4 females (964); *A. scutellinitens* 1 female (284); *A. specularia* 1 female (16); *A. surda* 1 female (208). Another 7 females and 6 males were carrying from 1 to 9 meloid triungulins each.

Salt (1927) detailed the morphological changes apparent in stylopized individuals of both sexes of *A. canadensis* and *A. hirticincta.* Basically, a stylopized individual tends to lose the strong definition of characters of its sex; that is, these characters tend to become modified in the direction of those of the opposite sex. Females are a little smaller than normal, the mesobasitarsi are narrower, the propodeal corbiculae often have some hairs almost throughout, and the metatibial scopae are often greatly reduced. Males are slightly larger, the mesobasitarsi are often wider, hair on the metasomal apical fasciae is more abundant, and the metatibiae are often more pubescent. Salt did not find any decrease in size or definition of the facial foveae of females, and this observation is confirmed here. He also observed that males had a distinct facial fovea-like area which, however, was never as well developed as in normal females. The two males of *A. aurihirta* and the six males of *A. hirticincta* showed this character as described by Salt. For Palearctic species of *Cnemidandrena,* Perkins (1918) listed *A. denticulata* Kirby and *A. fuscipes* Kirby as species known to be stylopized.

One male of *A. surda* was carrying two mite hypopi on the vertex just above the right compound eye.

SYSTEMATICS

Material Studied

The 4,485 North American specimens studied for this revision came from 36 collections in the United States and Canada. In the descriptive section, the depositories of primary and secondary types are indicated by the following abbreviations.

ANSP	Academy of Natural Sciences of Philadelphia
BLNM	Berlin Museum
BMNH	British Museum
CAS	California Academy of Sciences, San Francisco
CNC	Canadian National Collection, Ottawa
GEB	Dr. G. E. Bohart, Utah State University, Logan
GIS	Dr. G. I. Stage, National Museum of Natural History, Washington, D.C.
GSU	Georgia State University
JS	Mr. J. Schuh, Klamath Falls, Oregon
KU	University of Kansas, Lawrence
NDSU	North Dakota State University, Fargo
NMNH	National Museum of Natural History, Washington, D.C.
NSM	Nebraska State Museum, Lincoln
OSU	Oregon State University, Corvallis
PHT	Mr. P. H. Timberlake, Riverside, California
PLU	Provancher Collection, Laval University, Quebec
RWT	Dr. R. W. Thorp, University of California, Davis
UCB	University of California, Berkeley
UCD	University of California, Davis
UMINN	University of Minnesota, St. Paul
URI	University of Rhode Island, Kingston

Taxonomic Characters

LaBerge (1967), Ribble (1968), and Thorp (1969) have listed and described terminology used for the subgenera of *Andrena* studied by them. Most of the terms used for these subgenera also apply to *Cnemidandrena,* but a number of terms used here are new. For clarity, all specialized terms as used in this study are defined below; morphological terms not explained below are as used by Michener (1944).

1. Length – measured with head vertical, from the front of the face to the tip of the pygidial plate. The shortest and longest measurements are given.
2. Width – greatest width of abdomen. The narrowest and widest measurements are given.
3. Wing length – measured in a straight line from the base of cell M to the apex of the third submarginal cell. This is expressed as a mean, and standard deviation.
4. Facial length and width – length from the apicomedian margin of the clypeus to the lower median margin of the median ocellus; width between the inner margins of the compound eyes at the level of the lower margins of the antennal fossae. This is presented as a ratio (FL/FW) (fig. 2) and standard deviation.
5. Flagellar segments 1 and 2 of the male – measured along morphological lower surface. This is presented as a ratio (FS1/FS2) and standard deviation.
6. Eye length and width – both measured from the anterior aspect.
7. Malar space – width equals the maximum mandibular width at base; length measured just above median point of median articulation, where malar space is shortest, to bottom of eye.
8. Ventrobasal angle and lamella – ventrobasal angle is a ventral expansion of the lower margin of the mandible, so the lower margin is angled; ventrobasal lamella is a membranous flange along the posterior margin of the mandible.
9. Segmental ratio – length of maxillary and labial palpal segments, beginning in each case with basal segment.
10. Labral process – raised basal area in the center of the labrum.
11. Genal area – width measured in profile which is attained by superimposing the two lateral ocelli; the eye width with which the genal area width is compared is measured in the same view. The eye width here differs from that in no. 6.
12. Subgenal coronet – in females a row of stout, spine-like hairs along the rim of the mandibular fossa behind the mandible.
13. Facial foveal length and width – maximum measurable length and width presented as a ratio (FOVL/FOVW) and standard deviation.
14. Humeral angle and ridge – the posterolateral margin of the pronotum forms prominent angles, with the extreme lateral aspect produced forward and downward as a more or less distinct ridge (figs. 3 and 4).
15. Pronotal suture – a more or less distinct, shallow depression extending anterodorsally from near the anterior median margin of posterior pronotal lobe to, or just beyond, the humeral ridge somewhat above its midpoint (fig. 3).
16. Propodeal enclosure – the dorsomedian triangular area of the propodeum, usually delineated laterally by faint sutures and a difference in sculpture from the dorsoposterior surfaces.
17. Propodeal corbicula – lateral surfaces of the propodeum with encircling long, incurling plumose or weakly plumose hairs forming a pollen basket (fig. 5).
18. Trochanteral floccus – the long, curved, barbed hairs on the basal and lower area of the metatrochanter. When all the hairs on the ventral margin of the trochanter are long and curled, and are incorporated in the brush, the trochanter is said to be "perfect." When, on the other hand, the hairs of the basal half of the trochanter are conspicuously shorter than the rest, nearly straight, and are not incorporated into the brush, the floccus is said to be "imperfect" (Lanham, 1949).
19. Tergal fascia – apical or subapical band of more or less dense, recumbent, barbed, white to yellow hairs on terga 1 to 5.
20. Sternal fimbria – subapical band, 1 to several hairs wide, of long, erect to suberect, pale to black barbed hairs at least on outer thirds of sterna 2 to 5.

21. Apical fringe – a row of usually recumbent, barbed hairs on the apical edge, usually of sterna 1 to 5, very short in females, often very long in males.
22. Gonoforceps – of the male genitalia the structure resulting from the fusion of the gonostyli and gonocoxites (Rozen, 1951).

The terms tessellation and shagreening are used to describe the two main kinds of integumental sculpture found in *Cnemidandrena.* A tessellate surface is checkered with regular close-set ridges. A shagreened surface is covered with a closely set roughness, like the rough surfaced horse leather termed shagreen; or shark leather (LaBerge, 1967). Tessellation may be coarse, moderate, or weak; at first sight, because of light reflection from the depressed areas, coarsely or moderately tessellate surfaces may appear granulate.

Cockerell (1906) in his description of the male of *Andrena colletina* stated that the mesothorax and metathorax are granular, and Cockerell (1916) in his description of the female of *Andrena pertarda* described the mesothorax and metathorax as minutely granular. In both species these areas are in fact coarsely tessellate. Shagreening may be dense, moderate, or light. Light shagreening may be reticular and may approach and intergrade into weak tesselation.

Subgenus *Cnemidandrena* Hedicke

Cnemidandrena Hedicke, 1933, Mitt. Zool. Mus. Berl., 19: p. 213; Lanham, 1949, Univ. Calif. Publ. Entomol., 8: 211-212; LaBerge, 1964, Univ. Nebr. State Mus. Bull. 4: 303-304; Hirashima, 1964, J. Fac. Agric. Kyushu Univ. 13: 1, 39-69; Warncke, 1968, Mem. Estud. Mus. Zool. Univ. Coimbra 307: 1-110.

Type species. – *Melitta nigriceps* Kirby, 1802, by original designation.

Cnemidandrena are small to medium-sized bees, with integument black, and males with clypeus black. The females usually have prominent white or yellow metasomal tergal fasciae, sometimes absent on metasomal tergum 1. Species fly in late summer or fall.

FEMALE. Integument black. Vestiture white to yellow or gold with some black hairs. Facial quadrangle longer than broad to broader than long. Lateral ocellus separated from posterior margin of vertex by from 1 to 2 ocellar diameters. Face with strong vertical rugulae, frontal line moderately developed. Facial fovea broad to narrow, occupying more or less half of distance between eye and lateral ocellus, not extending below upper margin of clypeus. Galea tessellate, lateral surface about as wide as dorsal surface. Maxillary palpus short, at most with apical segment extending slightly beyond apex of galea; longer than labial palpus. Clypeus nearly flat, dull, punctured, with moderate hair, to markedly protuberant, polished, smooth, without hair medially. Labral process nearly flat to strongly reflexed, weakly emarginate to strongly bidentate. Malar space narrow. Mandible with well-developed ventrobasal lamella. Genal area in lateral view about 1.5 to 2.0 or more times as wide as eye. Subgenal coronet well developed. Pronotum with well-developed humeral angle and ridge; posterior pronotal lobe with weak suture extending dorsally from near anterior median margin to or just beyond humeral ridge. Propodeal corbicula well developed, with complete fringe of hairs anteriorly; hairs transgressing a short distance into interior anterodorsally, but remainder of interior free of hair. Tibial scopa compact, hairs of outer face simple or obscurely compound; trochanteral floccus imperfect except nearly perfect in one species; mesobasitarsus strongly expanded medially, nearly as wide as or wider than metabasitarsus. Forewing nearly hyaline to strongly darkened apically; 3 submarginal cells, occasionally 2 in aberrant specimens; pterostigma slender; vein 1st m-cu meeting second submarginal cell at or beyond middle. Posterior margins of all metasomal terga with conspicuous apical fasciae, usually very broad, sometimes obscuring tergal surface beneath; fascia absent or weak on first tergum in some smaller species. Metasomal terga usually weakly tessellate and punctured, or shagreened and impunctate.

MALE. Similar to female except: clypeus flat to moderately protuberant, punctured throughout with abundant long hair. Labral process moderately to strongly reflexed. Gena broad, with posterior mar-

gin rounded, weakly angulate, or produced to a strong angle with or without a strong ridge above. Pronotum with humeral angle and ridge somewhat more developed. Metasomal terga 1 to 4 with apical fasciae present but often weakly developed. Genital capsule with gonoforceps flattened, broadly expanded apically; aedeagus slender throughout to strongly expanded laterally near base.

Species Groups

Females of *Cnemidandrena* exhibit a remarkable constancy in subgeneric characters; variation is slight among species in the bidentate labral process, ventrobasal lamella, subgenal coronet, humeral angle and ridge, expansion of the mesobasitarsus, and distribution of hairs in about the anterodorsal third of the propodeal corbicula. Sculpturing of the integument, however, provides good characters for associating species, as does the attitude of the clypeus and the coloration of the wings. The distribution, attitude, and coloration of pubescence is of great importance in elucidating species relationships, and, in association with the other variable characters mentioned, is most definitive.

Males also are remarkably constant in subgeneric characters and because of this constancy are sometimes difficult to separate. Again, integumental sculpturing and pubescence are important, but the best character for many species is the degree of lateral expansion of the penis valves. The gonoforceps show subtle variation among species, but these differences are too slight to allow for species identification. The apical margin of the seventh sternum is a very unstable character within all species, and cannot be relied upon for identification.

The 26 North American species can be divided into 8 species groups on the basis of the morphological characters held in common, and in several instances on the geographical relationships of morphologically similar species.

A number of European and Japanese specimens were kindly made available by Dr. LaBerge and Dr. Hirashima respectively, and it was possible to allocate these species to North American groups. Unfortunately, the identification of the three European species is in doubt, as the names *denticulata, fuscipes,* and *nigriceps* are applied to at least six different species, one of which is not a *Cnemidandrena.* However, three species carry determination labels, so these will be taken as correct. The Japanese material consisted of three species, *A. albicaudata, A. maetae,* and *A. seneciorum,* all of which were described by Dr. Hirashima. The morphological characters of the eight species groups and a list of included species are given below. They are named after the most common or best known species in the group.

Apacheorum Group

Medium-sized to large species, length of females 7.3-8.5 mm, and 7.5-9.7 mm, length of males 6.5-9.3 mm; clypeus moderately protuberant, punctured throughout, with moderately dense vestiture; scutum, scutellum densely tesselate; wings lightly to moderately clouded apically; vestiture white except brown-black on metasomal terga 5 and 6 of female *A. apacheorum*; tergum 1 with sparse, long hair; apical fasciae narrow, sparse, present on about one-third or less of terga; male with penis valves widest medially or narrowing from base to bulbous apex (figs. 10 to 24).

Included species: *A. apacheorum, A. latinensis, A. rodilla.*

This group is similar to the Costillensis group, but the apical fasciae are much narrower and thinner, and the vestiture is white, not whitish-yellow. These differences are not

great, however, and these groups may be linked by new forms as yet undiscovered, perhaps from eastern Asia.

Costillensis Group

Medium-sized species, length of female 7.3-9.5 mm and 7.8-9.7 mm, length of male 6.2-6.8 mm and 6.5-9.0 mm; clypeus moderately protuberant, punctured throughout with moderately dense vestiture; scutum densely to lightly tessellate or nearly shiny medially, scutellum moderately tessellate except smooth, shiny in about anterior half; wings moderately clouded apically; vestiture whitish-yellow throughout, except brown-black on metasomal terga 5 and 6 of female *A. columbiana;* tergum 1 with long, abundant hair; apical fasciae obscuring half or more of terga; males with penis valves weakly expanded medially (figs. 25 to 39).

Included species: *A. costillensis, A. columbiana, A. pachucensis, A. albicaudata* (Japan).

The Japanese species has the metasomal tergal apical fasciae poorly formed on terga 1 and 2, and the disc with abundant, medium length, erect hair, but in other characters it fits well with this group. Males of this species were not available.

Mentzeliae Group

Large species, length of female 10.3-11.4 mm, length of male 8.6-10.4 mm; female clypeus strongly protuberant, almost entire clypeus except edges naked, very shiny, with few punctures, male clypeus with hair throughout; scutum densely tessellate, scutellum moderately tessellate, somewhat shiny anteriorly; wings moderately clouded apically; vestiture white on head and metasoma, light yellow on mesosoma; male with penis valves widely expanded at base, tapering to apex (figs. 40 to 44).

Included species: *A. mentzeliae.*

This monotypic groups is easily recognized by the large, shiny, naked clypeus in the females and the penis valves widely expanded basally in the males. The groups is quite distinctive and seems to be without close relatives.

Scutellinitens Group

Medium-sized to large species, length of female 7.8-8.9 mm, and 8.5-11.2 mm; length of male 5.9-7.8 mm, and 7.6-8.2 mm; clypeus moderately to strongly protuberant, punctured throughout to punctures widely spaced medially, shagreened to shiny, vestiture sparse to naked medially; scutum lightly to moderately tessellate, scutellum shiny throughout to lightly tessellate; wings moderately darkened apically; facial foveal vestiture off-white to brown or black; mesosoma with yellow, brown, or black hairs; metasomal terga 1 to 4 with apical fasciae obscuring about half or less of terga except thin on tergum 1, fasciae white or yellow; at least terga 3 and 4 with short, black hairs laterally on discs; terga 5 and 6 of females with dark brown or black hairs; males with penis valves widest at base, to broadening somewhat beyond base (figs. 45 to 54).

Included species: *A. scutellinitens, A. robervalensis, A. specularia, A. maetae* (Japan), *A. nigriceps* (Europe), *A. fuscipes* (Europe).

The species from Japan fits well within this group. *A. nigriceps* from Europe has much more black hair throughout than any other species, and *A. fuscipes* from Europe has only

light yellow hairs on the mesosoma and is without short, black hairs laterally on the disc of metasomal terga 3 and 4.

Nubecula Group

Small to medium-sized species, length of females 6.2-7.3 mm, and 8.9-9.7 mm; length of male 4.9-6.2 mm, and 5.6-7.5 mm; clypeus nearly flat to moderately protuberant and lightly to moderately shagreened, punctured throughout, vestiture sparse or nearly naked medially; scutum, scutellum lightly tessellate to very shiny; wings hyaline to strongly darkened apically and in marginal cell; vestiture white throughout; metasomal tergum 1 without hairs present apically and on disc, or with apical fascia of very sparse, erect hairs; terga 2 to 4 with fasciae very narrow, obscuring one-third of terga or much less; males with penis valves narrow but widest medially (figs. 55 to 74).

Included species: *A. nubecula, A. xanthigera, A. canadensis, A. bocensis, A. grindeliae.*

This group is characterized by the white vestiture, and narrow apical fasciae. In three species, *A. nubecula, A. canadensis,* and *A. bocensis,* the apex of metasomal tergum 1 is naked, except that in a few specimens of *A. nubecula* and *A. canadensis* a few hairs are present apically. *A. nubecula* differs somewhat from the remaining species in that the wings are very strongly darkened apically and in the marginal cell, the penis valves of the male are narrow basally, and the integument is more coarsely sculptured, but the other characters place it with this group.

Citrinihirta Group

Small to medium-sized species, length of female 6.6-7.9 mm, and 7.3-9.0 mm; length of male 5.3-5.9 mm, and 5.8-8.8 mm; clypeus moderately to strongly protuberant, very shiny with few punctures, naked or nearly naked medially; scutum, scutellym very shiny with few punctures; wings nearly hyaline to moderately clouded apically; vestiture yellow, light yellow or white throughout; metasomal tergum 1 with long hair throughout, terga 2 to 4 with apical fasciae wide, obscuring nearly half to more than half of terga; males with penis valves weakly expanded medially (figs. 75 to 99).

Included species: *A. citrinihirta, A. aurihirta, A. ramaleyi, A. bendensis, A. sulcata.*

Species of this group are distinguished by the shiny clypeus, scutum, and scutellum, and the wide yellow or white apical fasciae on metasomal terga 1 to 4.

Hirticincta Group

Large to medium-sized species, length of female 8.2-10.6 mm, and 11.5-14.5 mm; length of male 7.0-9.6 mm, and 10.0-12.5 mm; clypeus moderately protuberant with large, close punctures throughout; scutum densely tessellate, scutellum densely tessellate to weakly shiny in about anterior half; wings lightly to strongly marked apically; female metatibial scopal hairs black to light yellow; vestiture generally citrus yellow, greenish-yellow or nearly white. Metasomal apical fasciae wide, obscuring at least half of terga, metasomal tergum 1 with abundant hair throughout; males with penis valves strongly expanded medially forming recurved, hooked, or rounded processes (figs. 100 to 119).

Included species: *A. hirticincta, A. colletina, A. luteihirta,* and *A. surda.*

This group is easily distinguished in the males by the lateral expansions of the penis valves, a character not developed in this way to this extent in any other group. The

coloration of the females is similar except that *A. colletina* has the metasomal, apical fasciae white with short, black hairs laterally on metasomal terga 2 to 4.

Chromotricha Group

Medium-sized species, length of female 7.9-9.2 mm, and 7.5-9.7 mm; length of male 8.0 mm, and 5.9-8.5 mm; inner margins of compound eyes subparallel to strongly converging above; clypeus moderately protuberant, punctured throughout, shiny to moderately shagreened, vestiture sparse medially; scutum, scutellum moderately tessellate except scutellum nearly shiny anteriorly; wings moderately darkened apically; female facial foveae with vestiture white, dark brown or black; scutum with yellowish-white to brown or black hairs; metasomal tergum 1 with very sparse, white hairs apically, terga 2 to 4 with very narrow, apical fasciae obscuring about one-fourth of terga, discs of terga 2 to 4 with white or black hairs laterally; terga 5 and 6 of female with black hairs; male with inner margins of compound eyes converging very strongly above (fig. 7); posterior margin of gena above a point opposite about mid point of eye with a very strong ridge (figs. 8 and 9); penis valves widest basally, tapering from base to apex (figs. 120 to 129).

Included species: *A. chromotricha, A. peckhami, A. seneciorum* (Japan), *A. denticulata* (Europe).

This group is the easiest to recognize because of the convergent inner margins above the compound eyes in both sexes and the strongly developed genal ridge in the males; these characters are not found in any other group.

Evolutionary Relationships

LaBerge and Ribble (1972) considered that the subgenera *Cnemidandrena, Gonandrena,* and *Geissandrena* each possess characters which indicate that they are closely related to one another, and that they were each derived independently from a *Notandrena*-like ancestor, either in the Old World or New World. If in the New World, the *Notandrena*-like ancestor must have since become extinct. LaBerge and Ribble believe that *Cnemidandrena* probably diverged from its ancestors in the Old World and later migrated to the New World, and was followed by a *Notandrena* or *Gonandrena*-like bee which radiated to produce species of *Gonandrena.* The *Geissandrena* probably originated fron another *Notandrena*-like ancestor which migrated to the New World either at the same time as the ancestor of *Gonandrena* or at a still later time. LaBerge and Ribble described *Gonandrena avulsa* from Texas, and they believe this species is somewhat annectent between *Gonandrena* and *Notandrena* on one hand and between *Gonandrena* and *Cnemidandrena* on the other hand, which seems to support their hypothesis of a common heritage as outlined above.

Statements concerning evolutionary relationships of Old World *Cnemidandrena* to other Old World subgenera must await revision of these groups.

Cnemidandrena species are very similar morphologically, and differ mainly in integumental sculpturing and vestiture. Discussion of group relations must be based on subtle characters. Seven characteristics for which there appear to be plesiomorphic and apomorphic alternatives in *Cnemidandrena* are listed below. The alternatives are assumed by comparison with more primitive bees and sphecoid wasps, and with recently revised subgenera of *Andrena.* Two plesiomorphic characters are assumed to have more than one apomorphic alternative.

Plesiomorphic Characters	Apomorphic Alternatives
1. Vestiture white or with some brown to black hairs.	1. Vestiture citrus yellow.
2. Metasomal tergal fasciae narrow, present on all metasomal terga.	2. (a) Metasomal tergum 1 without a fascia. a (b) All metasomal terga with wide fasciae.
3. Clypeus nearly flat to moderately protuberant, hairy.	3. Clypeus protuberant, smooth, naked medially.
4. Inner margins of compound eyes diverging above.	4. Inner margins of compound eyes converging above.
5. Metasomal terga 2-5 without transverse depression.	5. Metasomal terga 2-5 with transverse depression.
6. Males with gena rounded posteriorly.	6. Males with gena strongly ridged posteriorly.
7. Penis valves moderately expanded laterally.	7. (a) Penis valves strongly expanded laterally. (b) Penis valves narrowing from base to apex.

This Apacheorum group possesses all plesiomorphic characters, and the Costillensis group possesses only one apomorphic alternative. The two groups differ chiefly in the width of the metasomal subapical fasciae and therefore may be regarded as closely related. Black or brown hairs in these two groups are found on metasomal terga 5 and 6 in 2 species; the absence of citrus yellow hairs and the absence of all but one apomorphic character in these two groups indicates that included species are among the most primitive of *Cnemidandrena.*

The monotypic Mentzeliae group is distinguished by its strongly protuberant, naked, and shiny clypeus, and penis valves widely expanded at base and tapering to the apex. On integumental sculpturing and pubescence it would seem to have affinities with the Costillensis group or perhaps with *A. sulcata* of the Citrinihirta group.

The Scutellinitens group possesses more brown or black vestiture than the Apacheorum or Costillensis groups, and one species has yellow vestiture. Off-white, brown, or black hairs in the facial foveae separate this group from the Apacheorum and Costillensis groups, but its closest affinities seem to be with the Apacheorum group because the metasomal tergal fasciae are not as wide as those of the Costillensis group.

The Nubecula group is characterized by white vestiture and reduction or absence of fascia on metasomal tergum 1. This whole group could have been derived from an *Apacheorum*-like ancestor.

Black hairs are associated with wide lateral expansion of the penis in two species of the Hirticincta group. The black hairs and appearance of the metasomal tergal fasciae suggest an affinity with the Scutellinitens group. All 4 species in the Hirticincta group have at least some yellow vestiture, and that of *A. luteihirta* is almost entirely citrus yellow.

The Citrinihirta group is without brown or black hairs, the penis is only moderately expanded laterally, and metasomal tergal fasciae obscure a large proportion of terga 1-5. The main affinities of this group appear to be with *A. luteihirta* of the Hirticincta group.

The Chromotricha group is distinctive in its possession of two apomorphic characters not found elsewhere in *Cnemidandrena.* Apart from these two characters, the narrow, white metasomal apical fasciae and integumental sculpturing appear to indicate an affinity with the Apacheorum group.

An attempt to express the relationships between groups is made in fig. 130.

Key to Females of *Cnemidandrena*

1. Metasomal tergum 5 with pubescence concolorous or nearly so with apical fasciae on anterior terga (pale) 2
   Metasomal tergum 5 with pubescence not concolorous with apical fasciae on anterior terga (dark) 17
2(1) Scutum smooth, shiny, at least in part 3
   Scutum tessellate, dull 12
3(2) Metasomal tergum 1 naked apically or with apical fascia very weakly developed 4
   Metasomal tergum 1 with abundant pubescence throughout 7
4(3) Metasomal tergum 1 normally naked apically or exceptionally with very few, widely spaced, erect hairs; wings hyaline 5
   Metasomal tergum 1 with thin, apical fascia of erect hairs; wings hyaline or darkened apically 6
5(4) Clypeus shagreened, not shiny; specimens from east of British Columbia, Idaho, Nevada and Arizona . . . . . *canadensis* Dalla Torre
   Clypeus shiny, not shagreened; specimens from Oregon and California . . . . *bocensis* Donovan
6(4) Wings hyaline; specimens from California . . . . . *grindeliae* Donovan
   Wings markedly darkened apically; specimens from the great basin area . . *xanthigera* Cockerell
7(3) Wings with a distinct, apical, dark spot; vestiture yellow or light whitish-yellow throughout 8
   Wings lightly clouded apically; vestiture white or nearly white 10
8(7) Vestiture light whitish-yellow; metasomal terga 2 to 4 with a distinct, transverse depression posteriorly to gradulus . . . . . *sulcata* Donovan
   Vestiture citrus yellow; metasomal terga 2 to 4 without transverse depression posteriorly to gradulus 9
9(8) Clypeus medially impunctate, naked; propodeal enclosure without a median, longitudinal depression, flat; metasomal tergum 2 on lateral margins anterior to apical fascia with a small patch of very short, appressed hairs . . . . . *citrinihirta* Viereck
   Clypeus medially with a few punctures and hairs; propodeal enclosure with a median, longitudinal depression; metasomal tergum 2 on lateral margins anterior to apical fascia without a small patch of short, appressed hairs . . . . . *aurihirta* Donovan
10(7) Scutum moderately shagreened, metanotum tessellate, dull . . . . . *pachucensis* Donovan
   Scutum polished, metanotum nearly polished, nearly shiny 11
11(10) Antenna bright yellow at least ventrally; clypeus moderately protuberant, punctured throughout, with hair throughout; metasomal terga 1 to 4 with apical fascia obscuring about half of tergal area or more . . . . . *ramaleyi* Cockerell
   Antenna reddish-brown ventrally; clypeus strongly protuberant, nearly impunctate and naked medially; metasomal terga 1 to 4 with apical fascia obscuring about one-third or less of tergal area . . . . . *bendensis* Donovan
12(2) Metasomal tergum 1 with disc and apical margin naked or with very few hairs . . . . . *nubecula* Smith
   Metasomal tergum 1 with hairs on disc and apically 13
13(12) Vestiture throughout citrus yellow; wings with prominent, dark, apical spot . . . . . *luteihirta* Donovan
   Vestiture white or nearly white throughout; wings lightly to moderately clouded apically 14
14(13) Clypeus strongly protuberant, almost impunctate except at edges, naked except edges with thin vestiture, very shiny . . . . . *mentzeliae* Cockerell
   Clypeus nearly flat to moderately protuberant, punctured and with hairs throughout 15
15(14) Metasomal terga 2 to 4 with apical fasciae well formed, obscuring about half of tergal area . . . . . *costillensis* Viereck and Cockerell
   Metasomal terga 2 to 4 with apical fasciae poorly formed, narrow, present on one-third or less of tergal area, not obscuring surface 16

16(15) Clypeus irregularly roughened in lower median half . . . . . *latinensis* Donovan
Clypeus smoothly rounded from side to side . . . . . *rodilla* Donovan
17(1) Compound eyes with inner margins converging above 18
Compound eyes diverging above except for incurved upper ends 19
18(17) Facial foveae with vestiture brown, mesosoma and metasomal terga dorsally with some black hairs . . . . . *peckhami* Cockerell
Facial foveae with vestiture white or nearly white, mesosoma and metasomal terga dorsally with white hairs only . . . . . *chromotricha* Cockerell
19(17) At least metasomal terga 3 and 4 with short, brown or black, erect hairs laterally on disc or facial foveae with brown vestiture 20
Metasomal terga 3 and 4 with only pale hairs laterally on disc, facial foveae with white vestiture 23
20(19) Scutum with at least some brown to black hairs 21
Scutum with white to yellow hairs only 22
21(20) Scutellum with anterior two-thirds polished, mirror-like; metasomal terga with black hairs laterally on disc very short . . . . . *specularia* Donovan
Scutellum lightly to moderately shagreened, not shiny; metasomal terga with black hairs laterally on disc moderately long . . . . . *robervalensis* Mitchell
22(20) Clypeus strongly protuberant, with few punctures, shiny, naked in broad, median area; scutellum with about anterior half shiny . . . . . *scutellinitens* Viereck
Clypeus nearly flat, with large punctures and vestiture throughout; scutellum densely tessellate, dull . . . . . *colletina* Cockerell
23(19) Metasomal terga 1 to 4 with white hair, tergum 1 with sparse, erect hairs, terga 2 to 4 with apical fasciae obscuring about one-third or less of tergal area . . . . . *apacheorum* Cockerell
Metasomal terga 1 to 4 with white, yellow or greenish-yellow hair, tergum 1 with abundant hair, terga 2 to 4 with apical fasciae obscuring at least half of tergal area 24
24(23) Wings strongly marked apically, almost black; metasomal terga 1 to 4 with vestiture yellow . . . . . *surda* Cockerell
Wings weakly to moderately clouded apically; metasomal terga 1 to 4 with vestiture white or greenish-yellow 25
25(24) Wings moderately clouded apically; metatibial scopa black in about dorsal half; general body vestiture except metasomal tergum 5 greenish-yellow . . . . . *hirticincta* Provancher
Wings weakly clouded apically; metatibial scopa white or nearly so; general body vestiture except metasomal tergum 5 light yellow or white . . . . . *columbiana* Viereck

Key to Males of *Cnemidandrena*

1 Scutum with at least a small area smooth, shiny, or compound eyes with inner margins converging above 2
Scutum shagreened or tessellate throughout, dull, and inner margins of compound eyes diverging above except for incurved upper margins 13
2(1) Inner margins of compound eyes converging above, posterior margin of gena very strongly ridged (figs. 7 to 9) 3
Inner margins of compound eyes diverging above except for incurved upper margins, posterior margin of gena without ridge 4
3(2) Scutum without black hairs . . . . . *chromotricha* Cockerell
Scutum with black hairs . . . . . *peckhami* Cockerell
4(2) At least metasomal tergum 4 with some brown or black hairs laterally on disc . . . . . *scutellinitens* Viereck
Metasomal terga with white or yellow hairs 5
5(4) Vestiture white or ~~off-white~~; wings strongly darkened apically and in marginal cell 6

Vestiture white with wings hyaline or very lightly shaded, or vestiture yellow; wings darkened apically 7

6(5) Posterior margin of gena opposite mid-point of eye spine-like (fig. 6), vestiture snow white . . . . . *xanthigera* Cockerell

Posterior margin of gena opposite mid-point of eye at most weakly spine-like; vestiture off-white . . . . . *nubecula* Smith

7(5) Vestiture white or nearly white, metasomal terga 3-5 with short hairs, wings hyaline or nearly so 8

Vestiture citrus yellow, yellow, or nearly white with metasomal terga 3-5 with some long hairs, wings nearly hyaline or moderately darkened apically 9

8(7) Clypeus moderately protuberant, punctures widely spaced in lower median area; labral process smoothly reflexed . . . . . *bendensis* Donovan

Clypeus nearly flat, closely punctured throughout; labral process angularly reflexed 10

9(7) Metasomal terga 2 to 5 with a deep, transverse groove just posterior to gradulus . . . . . *sulcata* Donovan

Metasomal terga 2 to 5 flat 11

10(8) Antenna bright yellow beyond first flagellar segment; specimens from Oregon and California . . . . . *bocensis* Donovan

Antenna reddish-brown ventrally beyond first flagellar segment; specimens from east of British Columbia, Idaho, Nevada and Arizona . . *canadensis* Dalla Torre

11(9) Antenna yellow beneath beyond first flagellar segment; tarsi light yellow; specimens from the great basin area . . . . . *ramaleyi* Cockerell

Antenna reddish-brown beneath beyond first flagellar segment; tarsi reddish; specimens from California and Oregon 12

12(11) Propodeal enclosure with a median, longitudinal depression . . . . . *aurihirta* Donovan

Propodeal enclosure flat, without a median longitudinal depression . . . . . *citrinihirta* Viereck

13(1) Penis valves markedly expanded near base, much wider than at base (figs. 100-101, 105-106, 110-111, 115-116) 14

Penis valves weakly expanded near base, not or little wider than at base (figs. 10-11, 15-16, 20-21, 25-26, 30-31, 35-36, 40-41, 45-46) 17

14(13) Wings hyaline or lightly darkened apically; metasomal terga 1 to 5 with apical fasciae white or greenish-yellow 15

Wings with a dark, almost black, apical spot; metasomal terga 1 to 5 with apical fasciae yellow to citrus yellow 16

15(14) Wings hyaline or very lightly darkened apically; metasomal terga 1 to 5 with apical fasciae white, disc of terga 3 to 6 with or without brown or black hairs; metafemur with white vestiture . . . . . *colletina* Cockerell

Wings lightly darkened apically; metasomal terga 1 to 5 with vestiture greenish-yellow; metafemur with at least a few brown or black hairs on upper edge . . . . . *hirticincta* Provancher

16(14) Vestiture yellow; metasomal terga moderately shagreened, dull . . . . . *surda* Cockerell

Vestiture citrus yellow; at least metasomal terga 4 and 5 very lightly shagreened, shiny . . . . . *luteihirta* Donovan

17(13) Scutellum at least in part smooth, shiny 18

Scutellum tessellate, dull throughout 22

18(17) Penis valves widest at base, narrowing gradually to apex (figs. 40-41, 45-46) 19

Penis valves with constriction between base and wide median area (figs. 10-11, 15-16, 20-21, 25-26, 30-31, 35-36) 20

19(18) Clypeus moderately protuberant, very shiny throughout . . . . . *mentzeliae* Cockerell

Clypeus flat, with median lower are impressed, upper periphery dull . . . . . *robervalensis* Mitchell

20(18) Labral process with depth of apical emargination more than half length of reflexed area; specimens from Mexico . . . . . *pachucensis* Donovan

Labral process with depth of apical emargination one-third or less of length of reflexed area; specimens from western United States 21

21(20) Tarsi light yellow . . . . . *costillensis* Viereck and Cockerell
Tarsi reddish . . . . . *columbiana* Viereck
22(17) Penis valves widest at base, narrower medially, then narrowing almost gradually to apex (figs. 20-21) . . . . . *rodilla* Donovan
Penis valves at least as wide just beyond base as at base (figs. 10-11, 15-16). 23
23(22) Penis valves with constriction between base and wide median area (figs. 10-11); specimens from the southwestern United States . . . . . *apacheorum* Cockerell
Penis valves with sides straight from base to median area (figs. 15-16); specimens from central Mexico . . . . . *latinensis* Donovan

Andrena (Cnemidandrena) apacheorum Cockerell

Andrena apacheorum Cockerell, 1897, Entomologist 30:306 female; 1898, Univ. N.M. Bull. Biol. Ser. 1:1, 49 (key); 1906, Trans. Am. Entomol. Soc. 32 (record); 1919, Can. Entomol. 51:272 (record); 1931, Am. Mus. Novit. 458:8 (record, key); 1937, Can. Entomol. 64:35 (relationship); Clements and Long, 1923, Carnegie Inst. Wash. Publ. 336:249 (ecology); Hicks, 1926, Univ. Colo. Stud. Ser. Biol. 15:221 (habits).

Andrena (Cnemidandrena) apacheorum, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1056.

FEMALE. *Measurements and ratios.* – N = 20; length, 7.5-9.7 mm; width, 2.6-3.2 mm; wing length, M = 2.97 ± 0.148 mm; FL/FW , M = 1.02 ± 0.096; FOVL/FOVW, M = 3.08 ± 0.190.

Integumental color. – Black except as follows: antenna medium brown below beyond first flagellar segment; mandible with apical half red; tibial spurs nearly white; tarsal claws with basal half yellow, apical half red; tegula shiny dark brown; wing veins medium brown; pterostigma yellow-brown; wing membranes moderately darkened apically, remainder hyaline; metasomal terga and sterna narrowly hyaline apically; pygidial plate red medially, sides nearly black.

Structure. – Scape very slightly longer than flagellar segments 1 to 3; flagellar segment 1 longer than flagellar segments 2 plus 3, equal to flagellar segments 3 plus 4. Eye 3.6 times longer than wide, with inner margin diverging above except for extreme upper margin curving inwards. Malar space 8 times wider than long. Mandible in repose extends for one-third its length beyond middle of labrum; notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea finely tessellate, lateral surface slightly narrower than dorsal surface. Maxillary palpus reaching very slightly beyond apex of galea; segmental ratio 0.8 : 1.0 : 0.9 : 0.8 : 0.7 : 0.7. Labial palpi basal segment moderately flattened laterally, moderately curved, apical segment attached subapically, segmental ratio 1.2 : 0.6 : 0.5 : 0.6. Labral process nearly flat, twice as wide as long, depth of median emargination about one-seventh length of labral process. Clypeus moderately protuberant, extending for one-third its length below level of eyes, upper peripheral half strongly shagreened with shagreening obscuring medium-sized punctures, median half smooth, shiny, with large punctures separated by 1 diameter except more widely separated medially. Supraclypeal area coarsely roughened with irregular, contiguous punctures. Genal area less than twice as wide as eye, whole area with medium-sized punctures separated by 3 diameters; upper half with narrow area near eye smooth, shiny, remainder with nearly reticular shagreening, dull. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, moderately tessellate with deep punctures separated by one-half diameter or less. Supraantennal area with longitudinal rugulae. Facial fovea widest above, narrowing slightly below, upper limits very indistinct but reaching above to a line through middle of lateral ocellus, reaching below to just below a line below antennal fossa.

Pronotum with humeral angle and ridge well developed except humeral ridge weakly depressed where crossed by pronotal suture; whole area shagreened. Scutum moderately tessellate, dull, with large, shallow punctures separated by 2 to 3 diameters with punctures moderately tessellate internally. Scutellum moderately tessellate in posterior half, but less so and nearly shiny in anterior half. Metanotum moderately tessellate in middle third, roughened by irregular punctures in lateral third. Propodeal enclosure with moderate tessellation except for anterior fringe of irregular, longitudinal rugulae. Dorsoposterior surface of propodeum with coarse tessellation and large, obscured punctures separated by 2 diameters. Mesepisternum moderately tessellate throughout with large punctures in dorsal half separated by 2 diameters, punctures smaller, more widely separated below. Metepisternum and lateral corbicular area of propodeum with reticular shagreening, corbicular area with a few

medium-sized punctures in anterior quarter. Mesobasitarsus widest medially, 2.6 times wider than long, equal in width to metabasitarsus. Metabasitarsus widest basally, more than 3 times longer than wide, two-thirds as wide as metatibia. Metatibia widest apically, 3 times longer than wide. Pterostigma slightly less than 4 times longer than wide; vein 1st m-cu meets second submarginal cell one-fourth of distance from apical end of cell.

Metasomal terga 1 to 5 moderately tessellate, tessellation less prominent on apical areas; discs of terga 1 to 4 with small, indistinct punctures separated by 4 to 5 diameters, punctures much closer on apical areas of discs; tergum 5 with large, irregularly spaced punctures on disc, apical area with small, crowded punctures posteriorly. Pygidial plate somewhat reflexed, rounded apically, with broad, median area raised and sides upturned, small punctures separated by half diameter on raised median area except for small, impunctate, posterior area. Sterna 1 to 6 weakly shagreened; sternum 1 with very small, shallow, V-shaped, median emargination, with medium-sized punctures separated by 3 diameters. Sterna 2 to 6 with small punctures separated by 3 diameters except for narrow, transverse, basal, impunctate areas on sterna 3 to 5.

Vestiture. – White except as follows: vestiture of basitarsi brown; metafemur with apical fringe black or nearly black; scopa with dorsal, basal hairs black or nearly black; metasomal terga 5 to 6 with pubescence black. Clypeus medially with hairs less dense than laterally. Propodeal corbicula with sparse hairs in anterodorsal fourth. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with apical fasciae obscuring about one-third of terga; tergum 1 with sparse, long, erect hairs throughout, except hairs reclining apically forming ill-defined fasciae; terga 2 to 4 apically with short, appressed hairs forming compact fasciae; tergum 2 with shorter, erect hairs on disc; terga 3 to 4 with short, sparse, erect hairs on disc. Tergum 5 with long, reclining hairs not wholly obscuring surface. Sterna 1 to 2 with long, erect hairs medially; sterna 2 to 5 with fimbriae of long, nearly erect hairs, hairs longest laterally, remainder of sternal area with short, sparse, erect hairs except for naked, basal, transverse areas. Sterna 2 to 5 with apical fringe hairs short.

MALE. *Measurements and ratios.* – N = 20; length, 6.5-9.3 mm; width, 1.8-2.5 mm; wing length, M = 2.50 ± 0.249 mm; FL/FW, M = 0.99 ± 0.075. FS1/FS2, M = 1.39 ± 0.031.

Integumental color. – As in female except metasomal terga and sterna more widely hyaline apically.

Structure. – About as in female except as follows: scape equal to flagellar segments 1 plus 2 plus one-third of flagellar segment 3; flagellar segment 1 almost 1.5 times longer than flagellar segment 2; flagellar segment 2 much shorter than flagellar segment 3. Eye length slightly less than 3.5 times width. Mandible in repose extends for one-fourth its length beyond middle of labrum. Maxillary palpus with half of apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.9 : 0.7 : 0.8 : 0.7 : 0.9. Labial palpal segmental ratio 1.1 : 0.5 : 0.3 : 0.5. Labral process strongly reflexed, twice as wide as long, median emargination deep, one-fifth length of reflexed area. Clypeus weakly protuberant, extending below level of eyes for two-fifths its length, whole surface with large, contiguous punctures except punctures separated medially by 1 diameter. Genal area opposite middle of eye produced to a blunt projection, genal area slightly less than twice as wide as eye. Paraocular areas with rugulae converging dorsally from near eye margin toward midline, with medium-sized punctures separated by 1 diameter opposite antennal fossa, punctures obscured above level of antennal fossa.

Pronotum with humeral angle and ridge very well developed except humeral ridge depressed where crossed by pronotal suture; whole area with reticular shagreening except area above between humeral ridge and pronotal suture vertically rugulate, below humeral angle smooth, shiny. Lateral areas of propodeum moderately tessellate.

Metasomal terga and sterna with punctures smaller and fewer on tergum 5. Sternum 7 (fig. 13) narrowing basally, broadly truncate apically with lateral angles of truncate area with sparse hairs. Sternum 8 (fig. 14) with apex and neck region a little longer than basal region, apex not markedly expanded, neck with abundant, long hairs. Gonoforceps (figs. 10 to 12) in dorsal view strongly ridged, in lateral view pointed apically. Penis valves in dorsal and ventral view widest medially, apex lobelike; in lateral view strongly bent downward, projecting well below gonoforceps.

Vestiture. – White throughout. Clypeus with abundant, long hairs. Metasomal terga 2 to 4 as in female except hairs of fasciae less appressed, slightly longer; vestiture of tergum 5 as for tergum 4. Sterna 1 to 5 with abundant, long hairs throughout; sternum 6 with short hairs.

Variation. – The median area of the clypeus in females may be almost impunctate or punctures may be scattered throughout. The genal angle in males varies in degree of development. In about 10 percent of the males the posterior edge of the gena above the angle seems to be slightly carinate.

Type material. – The holotype female (NMNH no. 4335) was taken at New Mexico, Otero Co., Tularosa Creek, by E. O. Wooton on August 23, 1897, at flowers of *Bigelovia graveolens.* The neallotype male (NMNH) (here designated) was collected at Arizona, Coconino Co., 6 km N. Flagstaff, by J. G. Rozen on July 29, 1961.

Parasites. – One female from Arizona, Coconino Co., 2 km N. Flagstaff, has one female stylops in its abdomen.

Range and localities. – This species has been taken in Utah, Colorado, Arizona, and New Mexico, with one record from eastern Nebraska (map 1). A total of 55 females and 34 males were examined. Altitude records range from 1,375 m to 3,437 m. All localities where *A. apacheorum* has been taken are listed below (including published records).

ARIZONA. *Cochise Co.:* Chiricahua Mountains, Flys Peak. *Coconino Co.:* 2 km N. Flagstaff, 6 km N. Flagstaff, 10 km W. Flagstaff, Hart Prairie, 19 km N.W. Flagstaff, Humphreys Peak at base, 8 km W. side San Francisco Mountains, Snow Bowl Flagstaff, Snow Bowl San Francisco Peaks. *Graham Co.:* Graham Mountains, Hospital Flat. *Pima Co.:* Mt. Lemon, Santa Catalina Mountains.

COLORADO. Guthrie. *Custer Co.:* 11 km W. Greenwood. *El Paso Co.:* Green Mountain Falls. *Garfield Co.:* Duck Lake. *Lake Co.:* Leadville. *Larimer Co.:* Estes Park, Pingree Park. *Mineral Co.:* Creede. *Park Co.:* Grant. *Pitkin Co.:* Aspen, Tennessee Pass. *Teller Co.:* Big Spring Ranch Florissant, Florissant.

NEBRASKA. *Lancaster Co.:* Lincoln.

NEW MEXICO. *Colfax Co.:* Ute Park Cimmaron Canyon. *Otero Co.:* Tularosa Creek. *San Miguel Co.:* Buelah, Sapello.

UTAH. *Box Elder Co.:* Willard Basin, Willard Peak. *Cache Co.:* Logan Canyon, White Pine Lake near Logan. *Iron Co.:* Miners Peak.

Flight records. – Collection dates for females range from June 30 to August 23, and for males from July 4 to August 16. With the exception of June 30, all collection dates are in late July and early August.

Floral records. – A total of 11 females and 1 male have been taken on the following flowers (including published records): 1 female, *Aster* sp., (N); 1 female, *Chrysothamnus nauseosus graveolens* (N); 1 female, *Cleome serrulata* (P,N); 4 females, *Erigeron* sp., (P,N); *E. macranthus;* 1 female, *Geranium* sp., (P,N); *G. caespitosum;* 1 male, *Iris missouriensis;* 1 female, *Martensia lanceolata* (N); 1 female, *Pastinaca* sp., (P,N); 1 female, *Ranunculus* sp., (N). Females of this species appear to be polylectic in pollen collection; seven females have collected pollen from four representatives of four plant families. The female recorded on *Cleome serrulata* also carries Compositae pollen. The female recorded on *Geranium* sp., is carrying pollen of this genus but mostly Compositae pollen plus pollen from other sources. The female taken on *Ranunculus* sp., is carrying pollen of *Geranium* sp., and also pollen from other sources.

Andrena apacheorum is quite similar morphologically to both *A. latinensis* and *A. rodilla,* but the clypeus in females is a little more protuberant and smoothly rounded from side to side. The vestiture is white except for metasomal segments 5 and 6 with brown vestiture; the apical fasciae are narrow and complete. This species is without features that may be regarded as specialized, and thus would seem to be the most generalized of *Cnemidandrena.*

Andrena (Cnemidandrena) latinensis Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 3; length, 7.9-9.0 mm; width, 2.8-2.9 mm; wing length, M = 2.99 ± 0.110 mm; FL/FW, M = 0.94 ± 0.101; FOVL/FOVW, M = 2.7 ± 0.060.

Integumental color. – Black except as follows: antenna dark red-brown below beyond third flagellar segment; mandible with more than apical third red; tibial spurs yellow; tarsal claws with basal half yellow, apical half red; tegula shining medium brown, wing veins dark brown, pterostigma light

brown medially; wing membrane lightly darkened apically, remainder of wing membrane hyaline; metasomal terga and sterna moderately widely hyaline apically, pygidial plate dark red-black.

Structure. – Scape a little shorter than flagellar segments 1 to 3; flagellar segment 1 a little shorter than flagellar segments 2 plus 3; flagellar segment 2 equal in length to flagellar segment 3. Eye nearly 4 times longer than wide with inner margin moderately diverging above except for incurved upper end. Malar space long, more than 5 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex, ventrobasal angle and lamella well developed. Galea weakly tessellate, dorsal surface somewhat wider than lateral surface. Maxillary palpus reaching to apex of galea, segmental ratio 0.6 : 0.7 : 0.5 : 0.7 : 0.5 : 0.7. Labial palpus with basal segment weakly compressed laterally, apical segment attached subapically, segmental ratio 0.9 : 0.5 : 0.4 : 0.6. Labral process twice as wide as long, with apical third moderately recurved, depth of apical emargination one-sixth length of labral process. Clypeus moderately protuberant, extending below eyes for two-fifths its length; broad, median, lower area roughened with very large, irregular punctures, very lightly shagreened, remaining area with smaller punctures, separated by 1 diameter or less with moderate shagreening. Supraclypeal area with medium-sized punctures obscured by moderate shagreening. Genal area less than twice as wide as eye, with medium-sized punctures separated by 2 diameters, very narrow area near eye shiny, remainder moderately shagreened. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized, deep punctures separated by 1 diameter, moderately tessellate. Supra-antennal area with regular, longitudinal rugulae and medium-sized, interrugal punctures. Facial fovea wide, 3 times longer than wide, widest above, rounded above and below, reaching above to a line through middle of lateral ocellus, reaching below to a line just above upper end of clypeus.

Pronotum with humeral angle and ridge very well developed, humeral ridge complete except very narrowly and scarcely depressed where crossed by pronotal suture; whole pronotum with moderate, reticular shagreening. Scutum, scutellum, metanotum with small punctures almost obscured by dense tessellation except scutellum in about anterior two-thirds with moderate tessellation, shiny. Propodeal enclosure with anterior fourth with irregular, longitudinal rugulae, medially with a longitudinal depression, remainder moderately tessellate; dorsoposterior surface with medium-sized punctures separated by 1.5 diameters, moderately tessellate; propodeal corbicular area with small, widely spaced punctures in anterior third, weakly tessellate. Mesepisternum with medium-sized punctures separated by 2 diameters, moderately tessellate. Metepisternum with weak, reticular shagreening. Mesobasitarsus widest just beyond mid-point, more than 2.5 times wider than long, equal in width to metabasitarsus. Metabasitarsus widest basally, slightly more than 3.5 times longer than wide, two-thirds width of metatibia. Metatibia widest apically, slightly curved ventrally, more than 3.5 times longer than wide. Wing with pterostigma 4 times longer than wide; vein 1st m-cu meets second submarginal cell less than one-fourth distance from end of cell.

Metasomal terga 1 to 4 with small to medium-sized discal punctures, separated by 2 to 3 or more diameters with punctures closer apically on discs except on tergum 1; moderately to lightly shagreened. Tergum 5 with large discal punctures separated by 1 to 2 diameters, lightly shagreened. Pygidial plate narrowly rounded apically, broad, median area and sides raised, median area with small, close punctures. Sternum 1 with small, shallow, apical, V-shaped, median emargination; sterna 1 to 6 with small punctures separated by 1 to 3 diameters, moderately shagreened.

Vestiture. – Hairs white except facial foveal hairs light silver, vestiture dorsally on mesosoma light yellow, femoral fringe and apical fimbria with hairs light brownish-gold. Clypeus with hairs very sparse medially. Scutum, scutellum, metanotum with hairs moderately dense. Propodeal corbicula with sparse, long, simple hairs in anterior third. Trochanteral floccus imperfect. Metasomal tergum 1 with long, erect, moderately abundant hairs throughout, hairs not forming a definite apical fascia; terga 2 to 4 with apical fasciae of short, appressed hairs, fasciae present on one-third of tergal surface, not wholly obscuring surface beneath; sternum 2 with long, erect hairs medially, hairs shorter laterally, sterna 3 and 4 with short, erect, sparse hairs on remaining area of discs. Tergum 5 with long, posteriorly directed hairs not obscuring surface of anterior half. Sterna 1 to 5 with apical fringes well developed; sterna 1 and 2 with long, erect, widely spaced hairs medially; sterna 2 to 6 with subapical fimbriae well developed laterally, poorly developed medially; sterna 3 to 6 with short, sparse, erect hairs on remaining areas.

MALE. *Measurements and ratios.* – N = 3; length, 7.9-8.9 mm; width, 2.5 mm; wing length, M = 2.87 ± 0.104 mm; FL/FW, M = 0.92 ± 0.118; FS1/FS2, M = 1.52 ± 0.036.

Integumental color. – Black except as follows; antenna reddish-brown beneath beyond flagellar segment 1; mandible with less than apical third red; mesosoma as in female except tegula dark brown, weakly hyaline; metasomal terga and sterna widely hyaline apically.

Structure. Scape shorter than flagellar segments 1 to 3: flagellar segment 1 1.6 times as long segments 1 and 2, flagellar segment 1 1.5 times as long as flagellar segment 2. Eye slightly less than 3.5 times longer than wide, with upper end broadly incurved. Malar space 6 times wider than long. Mandible in repose with notch of mandible tooth less than half distance between middle of labrum and mandible apex from middle of labrum. Galea as in female. Maxillary palpus with ultimate segment and apical half of penultimate segment projecting beyond apex of galea; segmental ratio 0.9 : 1.0 : 0.8 : 0.9 : 0.8 : 0.9. Labial palpus with basal segment strongly compressed and twisted laterally, ultimate and penultimate segments moderately compressed laterally, ultimate segment attached subapically, segmental ratio 1.3 : 0.7 : 0.6 : 0.7. Labral process twice as wide as long, very strongly reflexed, tuberculate at angle, apical emargination depth half length of reflexed area. Clypeus weakly protuberant, extending below eyes for nearly half its length; small, lower, median area depressed, with large punctures separated on depressed area by 1 diameter, separated on remainder by one-half diameter or less, shiny. Supraclypeal area with crowded, medium-sized punctures. Genal area 1.75 times as wide as eye, produced posteriorly opposite mid-point of eye to a well-developed, blunt projection, with poorly developed ridge running dorsally to vertex from blunt projection. Whole area with medium-sized punctures separated by 2 diameters; broad, median area heavily shagreened; remaining area more lightly shagreened except very narrow area near eye shiny. Vertex, supra-antennal area as in female except rugulae of supra-antennal area more prominent, punctures more obscure; paraocular area as for supra-antennal area.

Pronotum with humeral angle and ridge very well developed, humeral ridge broadly depressed where crossed by obscure pronotal suture; area below humeral angle and ridge with dorsoventral rugulae, shiny below pronotal suture, remainder of pronotum shagreened. Remainder of thorax as in female except punctures dorsally of medium size, separated by 1.5 to 2 diameters, punctures densely tessellate within, propodeal enclosure with irregular, longitudinal rugulae in anterior half, vein 1st m-cu meeting second submarginal cell about middle.

Metasomal terga 1 to 5 with disc with small punctures separated by from 1 to 2 diameters, except punctures closer on apices of discs; lightly to moderately shagreened. Sterna 1 to 6 much as in female except sternum 1 with apical median emargination deeper, sterna 2 to 5 with lateral, subapical area with medium-sized punctures separated by 1 diameter. Sternum 7 (fig. 18) with basal apodemes rounded basally; apex rounded with abundant hairs. Sternum 8 (fig. 19) with apex and neck region nearly 1.5 times as long as basal region, apex with shallow broad emargination, neck with abundant, long hairs. Gonoforceps (figs. 15 to 17) in dorsal view broad apically, with strong, oblique ridge reaching outer edge. Penis valves in dorsal and ventral view slightly wider medially than basally, apex weakly expanded; in lateral view penis turned sharply downwards at right angle, projecting well below gonoforceps.

Vestiture. – Off-white throughout: Clypeus with surface obscured by long, white hair. Scutum, scutellum, with hair long, moderately dense. Metasomal tergum 1 with long, erect hairs on disc, not forming a definite apical fascia; terga 2 to 5 with poorly formed, apical fasciae of short, posteriorly directed hairs, fasciae present on more than one-third but less than one-half tergal area, not obscuring surface, remaining areas of discs with longer, more erect, moderately dense hairs. Sterna 1 to 6 with vestiture as in female except apical fringes very well developed on sterna 2 to 5, remaining hairs longer, more dense.

Variation. – In the two paratype females vein 1st m-cu meets the second submarginal cell beyond the middle. In the allotype male this vein in the right wing meets the second submarginal cell as in the paratype females, but in the left wing it meets the second submarginal cell just before the middle. Similar variation is found in the two paratype males. One paratype male has the clypeus more strongly depressed medially than in the other two specimens.

Type material. – The holotype female (UCB no. 11130) and two paratype females (UCB) were taken 8 km N. Guanajuato, Guanajuato, Mexico, by J. W. MacSwain on July 25, 1954. The allotype

male (KU) was taken at Nevado de Toluca, Mexico, MEXICO, by H. E. Evans on July 11, 1951 at 3,280 m. Two paratype males (KU) were taken at Tlaxcala, 16 km N. Apizaco, Mexico, by R. B. Roberts on August 19, 1962 at 2,438 m on *Argemone* sp.

Parasites. – None.

Range and localities. – *A. latinensis* has been taken from three localities in central Mexico near Mexico City (map 2). Only three females and three males were available. All location data are given under "Type material." Two altitude records are 2,438 m and 3,280 m.

Flight records. – The females were taken on July 25, and the males on July 11 and August 19.

Floral records. – Two males were taken on *Argemone* sp.

All six specimens are in very poor condition. The vestiture is matted because of wetting, but major characters are discernible nevertheless. *A. latinensis* seems to be close to *A. apacheorum* and *A. rodilla,* but is distinguished from these species by the angular roughening of the clypeus and the less well-defined metasomal apical fasciae.

Andrena (Cnemidandrena) rodilla Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 6; length, 7.3-8.5 mm; width, 2.4-2.7 mm; wing length, M = 2.65 ± 0.074 mm; FL/FW, M = 1.01 ± 0.017; FOVL/FOVW, M = 2.01 ± 0.191.

Integumental color. – Black except as follows: antenna reddish-brown beneath beyond second flagellar segment; mandible with apical half bright red; tibial spurs light yellow; tarsal claws with basal half yellow, apical half red; tegula dark hyaline brown, wing veins dark brown, pterostigma light brown; wing membrane moderately clouded apically, remainder hyaline; metasomal terga narrowly hyaline apically, pygidial plate dark reddish-black; sterna widely hyaline apically.

Structure. – Scape longer than flagellar segments 1 to 3; twice as long as flagellar segment 1; flagellar segment 1 slightly longer than flagellar segments 2 plus 3; flagellar segments 2 and 3 equal in length. Eye more than 3.5 times longer than wide with inner margin moderately diverging above except for incurved upper end. Malar space long, length one-fifth width. Mandible in repose extends for nearly one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex; ventrobasal angle and lamella well developed. Galea weakly tessellate, dorsal surface wider than lateral surface. Maxillary palpus with half apical segment extending beyond apex of galea; segmental ratio 0.9 : 0.9 : 0.6 : 0.6 : 0.5 : 0.5. Labial palpus with basal segment strongly compressed laterally, weakly curved laterally, segmental ratio 0.8 : 0.4 : 0.3 : 0.5. Labral process nearly flat, about 2.5 times wider than long; apical emargination broad, shallow, depth one-fifth length of labral process. Clypeus moderately to strongly protuberant; extending below eyes for two-fifths its length, with large, widely spaced punctures in lower median area, punctures smaller and separated by 1 diameter above and laterally; upper half with dense shagreening nearly obscuring punctures, shagreening light in lower half. Supraclypeal area with punctation obscured by dense shagreening. Genal area 1.3 times wider than eye, with small punctures separated by 1 to 2 diameters and moderately shagreened except for narrow, smooth, shiny area near eye. Vertex above lateral ocellus wider than 1 ocellar diameter, with medium-sized, deep punctures separated by less than 1 to 2 diameters, with moderate tessellation. Supra-antennal area with longitudinal rugulae and medium-sized, irregularly spaced, interrugal punctures. Facial fovea wide, 3 times longer than wide, widest medially, rounded above and below, extending above to a line above median ocellus, extending below to a line slightly below upper limit of clypeus.

Pronotum with humeral angle moderately developed, humeral ridge poorly developed, pronotal suture very obscure, not crossing humeral ridge; pronotum with small, widely spaced punctures above, whole area moderately shagreened. Scutum, scutellum, metanotum, and dorsoposterior face of propodeum with medium-sized punctures separated by 1 to 2 diameters, punctures almost obscured by dense tessellation, dull. Propodeal enclosure with narrow, anterior fringe of irregular rugulae, remainder densely tessellate; lateral surface with medium-sized, widely spaced punctures in anterodorsal fourth, moderately tessellate. Mesepisternum with medium-sized punctures separated by 2 diameters, moderately tessellate. Metepisternum moderately shagreened, dull. Mesobasitarsus widest medially, 2.6 times longer than wide, wider than metabasitarsus. Metabasitarsus widest basally, nearly 4 times longer than wide, three-fourths width of metatibia. Metatibia widest apically, slightly curved ventrally,

4 times longer than wide. Wing with pterostigma more than 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-fourth distance from end of cell.

Metasomal terga 1 to 4 with small punctures, separated on discs of terga 1 and 2 by 1.5 to 2 diameters, more widely spaced on discs of terga 3 and 4; closer apically on discs of terga 2 to 4; moderately tessellate including apical, depressed areas; tergum 5 with punctures on disc large, deep, separated by 2 diameters or more, weakly tessellate. Pygidial plate rounded apically, sides and median area very strongly raised, apical half smooth, basal half with small, close punctures. Sternum 1 with moderately large, median, V-shaped emargination; sterna 1 to 6 with small punctures separated by 2 diameters except sternum 1 with punctures larger; lightly shagreened.

Vestiture. – White or nearly white throughout. Clypeus with hairs sparse medially. Scutum with few hairs dorsally, scutellum with anterior half with few hairs. Propodeal corbicula with widely spaced, long, simple hairs in anterodorsal fourth. Trochanteral floccus imperfect. Metasomal tergum 1 with long, erect hairs throughout on disc, hairs not forming a definite, apical fascia; terga 2 to 4 with apical fasciae of short, appressed hairs, fasciae obscuring one-third of terga; tergum 1 with disc with long, erect hairs medially, shorter, erect hairs laterally; terga 3 and 4 with short, erect, sparse hairs on discs, hairs not obscuring surfaces. Sterna 1 to 5 with apical fringes well developed; sterna 2 to 5 with subapical fimbriae moderately developed in lateral thirds, poorly developed in median thirds, sterna 1 to 6 with erect hairs on remaining areas, longest on sterna 1 and 2, shorter on sterna 3 to 6.

MALE. *Measurements and ratios.* – N = 1; length, 7.3 mm; width, 1.9 mm; wing length, 2.3 mm; FL/FW, 0.95; FS1/FS2, 1.65.

Integumental color. – Black except as follows: antenna reddish-brown ventrally beyond first flagellar segment; mandible with apical third red; tibial spurs white, tarsal claws as in female; tegula light hyaline brown, wing veins medium brown, except submarginal vein dark brownish-black, pterostigma light brown; wing membrane as in female; metasomal terga and sterna moderately widely hyaline apically.

Structure. – Scape shorter than flagellar segments 1 to 3; flagellar segment 1 1.6 times as long as flagellar segment 2; flagellar segment 2 equal to flagellar segment 3. Eye 3.5 times longer than wide with inner margin diverging strongly above except for upper end incurved. Malar space, mandible, and galea much as in female except malar space slightly shorter, mandible without ventrobasal angle and lamella. Maxillary palpus with apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.6 : 0.4 : 0.6 : 0.4 : 0.5. Labial palpus as in female except segmental ratio 0.7 : 0.4 : 0.4 : 0.4. Labral process strongly reflexed, twice as wide as long, median emargination broad, depth one-third length of reflexed area. Clypeus moderately protuberant, extending below eyes for one-third its length with large, close punctures, upper third lightly shagreened, remainder shiny. Supraclypeal area with medium-sized, close punctures and moderate shagreening. Genal area 1.25 times as wide as eye, with small to medium-sized punctures throughout separated by 1 to 2 diameters; moderately shagreened except for very narrow shiny area near eye. Vertex and supraclypeal area as in female. Paraocular area with irregular rugulae angled towards lateral ocelli, and irregularly spaced, medium-sized punctures.

Pronotum with humeral angle and ridge moderately developed, except humeral ridge broadly depressed medially where crossed by evident pronotal suture, with small punctures dorsally; whole area moderately shagreened except angle between humeral ridge and pronotal lobe below pronotal suture shiny. Remainder of thorax as in female except punctures less evident in scutum, scutellum, and metathorax; propodeal enclosure with anterior half with irregular, longitudinal rugulae, remainder densely tessellate; wing with vein 1st m-cu meeting second submarginal cell slightly beyond middle.

Metasomal terga 1 to 5 with small punctures on disc, separated by 3 diameters except closer apically on terga 2 to 5, with light tessellation. Sterna 1 to 6 as in female except punctures larger with very light shagreening, shiny. Sternum 7 (fig. 23) with basal apodemes narrowing basally; truncate apically; shoulders with short hairs. Sternum 8 (fig. 24) with apex and neck region nearly 1.5 times longer than basal region, apex scarcely expanded, neck wide with abundant, long hairs. Gonoforceps (figs. 20 to 22) in dorsal view expanded and rounded apically, with oblique ridge not reaching outer edge. Penis valves in dorsal and ventral view with sides tapering gradually from base to lobe-like apex; in lateral view not turned sharply downward, shorter than gonoforceps.

Vestiture. – White or nearly white throughout. Clypeus obscured by long, dense hairs. Scutum, scutellum with sparse, erect hair. Metasomal tergum 1 with long, erect hair throughout, not forming a distinct, apical fascia; terga 2 to 5 with apical fasciae of short, close hairs, fasciae present on less than one-third of tergal areas, nearly obscuring surfaces; tergum 2 with long, erect hairs, longest medially; terga 3 to 5 with remaining areas of the discs with short, erect, sparse hairs. Sterna 1 to 6 with sparse, long, erect hairs throughout; sterna 1 to 5 with well developed, apical fringes.

Variation. – In females, the position of vein 1st m-cu in meeting the second submarginal cell ranges from just beyond the middle of the cell to about one-fourth of distance from the end of the cell.

Type material. – All type material was collected at Meadow Valley, 10 km S. Colonia Garcia Sierra Madre, Chihuahua, Mexico, by Townsend. The holotype female, allotype male, and four paratype females are number 71076 in the NMNH collection. Two paratype females are in the UCD collection.

Parasites. – None.

Range and localities. – Collection data are given under "Type material." The collection location is shown in map 2.

Flight records. – None.

Floral records. – None.

This species seems to be closely related to both *A. apacheorum* and *A. latinensis.* All eight specimens have had the vestiture wetted and consequently some details are somewhat unclear. However, the metasomal apical fasciae are much wider than in both *A. apacheorum* and *A. latinensis,* and terga 5 and 6 have the vestiture concolorous with that of terga 1 to 4.

Andrena (Cnemidandrena) costillensis Viereck and Cockerell

Andrena costillensis Viereck and Cockerell, 1914, Proc. U.S. Natl. Mus. 48:50 female; Cockerell, 1928, Univ. Colo. Stud. Ser. Biol. 16:2; Cockerell, 1931, Am. Mus. Novit. 458:14, female male (record, key); Cockerell, 1937, Can. Entomol. 69:34 (record).

Andrena (Cnemidandrena) costillensis, Lanham, 1949, Unvi. Calif. Publ. Entomol. 8:212; Linsley in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1062.

FEMALE. *Measurements and ratios.* – N = 20; length, 7.3-9.5 mm; width, 2.4-2.9 mm; wing length, M = 2.57 ± 0.127 mm; FL/FW, M = 1.04 ± 0.110; FOVL/FOVW, M = 3.19 ± 0.190.

Integumental color. – Black except as follows: antenna reddish-brown ventrally beyond second flagellar segment; mandible with apical half red; tibial spurs white lightly tinged with yellow; mediotarsi, distitarsi yellow-brown; basal half of tarsal claws yellow, apical half red; tegula, wing veins brown, pterostigma light yellow, wing membrane with broad, apical area lightly to moderately darkened, lightly darkened along veins in remainder. Metasomal terga and sterna moderately to widely hyaline apically; pygidial plate dark red-brown.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 equal to flagellar segments 2 plus 3; flagellar segment 2 a little shorter than flagellar segment 3. Eye a little less than 4 times longer than wide, with inner margin moderately diverging above except for upper end incurved. Malar space 9 times wider than long. Mandible in repose extending for a little more than one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, dorsal surface nearly 1.5 times wider than lateral surface. Maxillary palpus reaching to apex of galea, segmental ratio 0.7 : 0.9 : 0.8 : 0.8 : 0.6 : 0.6. Labial palpus laterally compressed, hardly curved, apical segment attached subapically, segmental ratio 1.3 : 0.6 : 0.5 : 0.6. Labral process weakly recurved apically, twice as wide as long; depth of apical emargination one-sixth length of labral process. Clypeus moderately protuberant, extending below eyes for less than half its length, with large punctures separated medially by 1 diameter or slightly less; punctures smaller, closer dorsally and laterally, upper third with moderate to heavy shagreening, very narrow apical margin lightly shagreened. Supraclypeal area with medium-sized punctures obscured by moderate shagreening. Genal area less than twice as wide as eye, with small punctures separated by 3 diameters, with moderate shagreening except for very narrow, shiny area near eye. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized punctures separated by 1

diameter or less, with moderate tessellation. Supra-antennal area with longitudinal rugulae and indistinct interrugal punctures. Facial fovea 3 times longer than wide, widest and rounded above, narrower, more pointed below, reaching above to a line above median ocellus, reaching below to a line a little less than equidistant between antennal fossa and clypeus.

Pronotum with humeral angle and ridge well developed; humeral ridge scarcely depressed where crossed by pronotal suture, with small to medium-sized punctures separated by 1 diameter, whole pronotum moderately shagreened. Scutum with medium-sized punctures nearly obscured by moderate tessellation. Scutellum with nearly large punctures separated by 1 or more diameters, with moderate tessellation on posterior half; anterior half with tessellation almost absent, nearly shiny. Metanotum with rough, moderate tessellation obscuring medium-sized punctures. Propodeal enclosure with anterior fringe of indistinct rugulae, posterior half with broad, shallow, median, longitudinal depression, whole area moderately tessellate; dorsoposterior surface as for metanotum; lateral corbicular surface with medium-sized, widely irregularly spaced punctures in anterior third, with light tessellation. Mesepisternum with nearly large punctures separated by 1 diameter, with moderate tessellation tending to obscure punctures. Metepisternum with very small punctures on upper half, with reticular shagreening. Mesobasitarsus widest medially, 2.6 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest medially in basal third, more than 3 times longer than wide, two-thirds width of metatibia. Metatibia widest apically, curved ventrally, length less than 3 times width. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell less than one-third distance from end of cell.

Metasomal terga 1 to 4 with small discal punctures separated by 2 to 3 diameters but closer on apical margins of discs; tergum 5 with large, irregularly spaced, discal punctures. Pygidial plate narrowly rounded apically, sides and middle nearly flat; anterior half with small, close punctures, posterior half smooth. Sternum 1 with small, median, apical, V-shaped emargination, with medium-sized punctures separated by 2 diameters; sterna 2 to 6 with slightly smaller punctures similarly distributed.

Vestiture. – Yellow-white throughout. Clypeus with vestiture thinner medially. Scutum and scutellum with hairs throughout, but hairs short dorsomedially on scutum. Propodeal corbicula with long, plumose hairs in anterior third. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with apical fasciae of recumbent hairs, fasciae obscuring half of terga, except fascia of tergum 1 with most hairs erect, not obscuring surface; remainder of discs of terga 1 to 4 with sparse, erect hairs, longest on tergum 1, shorter on tergum 2, shortest on terga 3 and 4. Tergum 5 with hairs not obscuring surface in anterior half. Sternum 1 with long, erect hairs; sterna 1 to 5 with apical fringes of short, widely and nearly evenly spaced plumose hairs; sterna 2 to 5 with subapical fimbriae well developed in lateral thirds, poorly developed in median thirds; remainder of sterna with sparse, erect hairs, shortest anteriorly.

MALE. *Measurements and ratios.* – N = 4; length, 6.2-6.8 mm; width, 1.9 mm; wing length, M = 2.15 ± 0.065 mm; FL/FW, M = 1.01 ± 0.076; FS1/FS2, M = 1.26 ± 0.128.

Integumental color. – Antenna red-brown ventrally beyond first segment; mandible with apical third red; tegula hyaline shining dark brown; wing veins dark brown; pterostigma yellow; wing membrane lightly darkened apically. Tibial spurs white with very light tinge of yellow. Mediotarsi, distitarsi, basal half of tarsal claws yellow; apical half of tarsal claws red. Metasomal terga with depressed apical area hyaline. Sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 plus 2 plus more than half of flagellar segment 3; flagellar segment 1 longer than flagellar segment 2; flagellar segment 2 very slightly shorter than flagellar segment 3. Eye a little more than 3 times longer than wide, with inner margin moderately diverging above except for somewhat incurved upper end. Malar space, mandible and galea as in female except mandible without ventrobasal lamella. Maxillary palpus with most of apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.7 : 0.6 : 0.7 : 0.7 : 0.6. Labial palpus with basal segment laterally compressed, curved, apical segment attached subapically, segmental ratio 1.3 : 0.6 : 0.5 : 0.7. Labral process strongly reflexed, twice as wide as long, depth of apical emargination half length of reflexed area. Clypeus weakly protuberant, extending below eyes for less than half its length, with large punctures; punctures as much as 2 diameters apart in lower median area, crowded in upper and lateral areas, shiny. Supraclypeal area with crowded, medium-sized punctures and light shagreening. Genal area less than twice as wide as eye, produced to a weakly developed, blunt projection opposite about midpoint of eye, with medium-sized punctures separated by 1 to 2 diameters; small posterior area shagreened,

remainder shiny. Vertex as in female. Supra-antennal area with longitudinal rugulae with large, closely spaced, interrugal punctures. Paraocular areas with large, closely spaced punctures.

Pronotum with humeral angle and ridge well developed except humeral ridge broadly depressed where crossed by pronotal suture, area above pronotal suture with strong, dorsoventral rugulae, pronotum dorsally with obscure, medium-sized punctures, area above humeral ridge strongly shagreened, area below humeral ridge shiny or nearly so. Remainder of mesosoma as in female except as follows: propodeal enclosure with rugulae in anterior half more strongly developed than in female; lateral areas of propodeum with medium-sized, widely spaced punctures and dense, reticular shagreening.

Metasomal terga 1 to 5 as for female terga 1 to 4 except punctures less distinct, tessellation very light, surfaces nearly shiny on terga 3 to 5. Sternum 1 with median, apical, V-shaped emargination, larger than in female, sterna 1 to 6 with small to medium-sized punctures separated by 3 diameters; sternum 1 shiny, sterna 2 to 6 lightly shagreened, nearly shiny. Sternum 7 (fig. 28) with basal apodemes weakly angled on outer posterior margin; apex of sternum truncate with long hairs laterally, inner apical margin excavated. Sternum 8 (fig. 29) with neck region widening strongly in basal half, apex not expanded; neck region with abundant, long hairs, basal region pointed basally. Gonoforceps (figs. 25 to 27) in dorsal view with oblique ridge reaching outer edge. Penis valves moderately expanded medially, narrowing to lobelike apex; in lateral view projecting well below gonoforceps.

Vestiture. – White tinged lightly with yellow. Clypeus with long, abundant hairs obscuring surface. Scutum with long, erect hairs throughout. Scutellum with long, erect hairs except on nearly shiny areas. Metasomal terga 1 to 5 with apical fasciae obscuring a little more than one-half terga; fascia on tergum 1 with hairs more erect, less dense; terga 2 to 5 with fascial hairs recumbent; remaining discal areas of terga 1 to 5 with erect, sparse hairs, longest on tergum 1, shorter on tergum 2, shortest on terga 3 to 5. Sternum 1 with sparse, long, erect hairs; sterna 1 to 5 with moderately developed, apical fringes; sterna 2 to 6 with long hairs laterally, shorter hairs medially.

Variation. – In females the width above the facial fovea varies slightly.

Type material. – The holotype female (NSM no. 2294) was collected in Colorado. The neallotype male (CAS no. 11,129) (here designated) was taken in Leavitt Meadow, Mono Co., California, by H. B. Leech on August 13, 1963, in a flight trap at 2,250 m.

Parasites. – One female from Ute Creek, Montrose Co., Colorado, has one female stylops in its abdomen, as does one female from Teton Co., Idaho, and one female from Grand Teton National Park, Teton Co., Wyoming.

Range and localities. – *Andrena costillensis* has been taken from the Great Basin region, but there are no records from Nevada and only one from California (map 3). Altitude records range from 2,190 m to 2,813 m. Totals of 69 females and 4 males were studied. All localities, including published records, are listed below.

ARIZONA. *Coconino Co.:* Kaibab Forest, North Rim Grand Canyon, Bright Angel Point.

CALIFORNIA. *Mono Co.:* Leavitt Meadow.

COLORADO. Eldora, Sage Flats, St. Mary's Glacier, Sierra Blanca, Tolland. *Boulder Co.:* 6 km W. Jamestown, Moraine Science Lodge, Peaceful Valley, Ward. *Gilpin Co.:* Lump Gulch. *Grand Co.:* Lake Granby Stillwater Campgrounds. *Jackson Co.:* Walden. *Lake Co.:* Leadville, Snowdon. *Larimer Co.:* Cameron Pass, Medicine Bow Mountains, Pingree Park. *Mineral Co.:* Creede. *Montrose Co.:* Ute Creek. *Pitkin Co.:* Tennessee Pass. *Routt Co.:* Steamboat Springs.

IDAHO. *Teton Co.*

NEW MEXICO. *Taos Co.:* Costilla Mountains.

UTAH. *Cache Co.; Garfield Co.:* 35 km N. Escalante. *Grand Co.:* Warner Ranger Station 45 km E.S.E. Moab. *Uintah Co.:* Jensen, 22 km S. Manila.

WYOMING. *Albany Co.:* 45 km E. Laramie, Summit, Tie Siding. *Fremont Co.:* Sinks Canyon 13 km S.W. Lander, South Pass City. *Natrona Co.:* Bates Creek 35 km S. Casper. *Teton Co.:* Grand Teton National Park.

Flight records. – Female specimens have been taken from July 14 to September 3, and male specimens have been taken from July 14 to August 18; and 90 percent of all specimens were taken in August.

Floral records. – Floral records for 8 females and 1 male are as follows: 1 female, *Archillea millefolium* (P,N); 1 female, *Chrysothamnus* sp., (P,N); 1 female, 1 male, *Erigeron* sp., (P,N); 2 females, *Grindelia* sp., (P,N); 1 female, *Gutierrezia sarothrae* (P,N); 1 female, *Heterotheca* sp., (P,N).

Females of *A. costillensis* are oligolectic on flowers of species of Astereae.

The three species in the Costillensis group, *A. costillensis, A. columbiana,* and *A. pachucensis* are quite similar in structure and vestiture. However, *A. costillensis* females are readily distinguished from *A. columbiana* by the light yellow-white vestiture throughout, and from *A. pachucensis* by the dull, somewhat shiny scutum. There are also slight differences in the clypeus and labral process among the three species. Males of *A. costillensis* and *A. columbiana* are very difficult to separate, and it is possible that many of the males placed in *A. columbiana* are really males of *A. costillensis.*

Andrena (Cnemidandrena) columbiana Viereck

Andrena (Andrena) columbiana Viereck, 1917, Trans. Am. Entomol. Soc. 43:374 female; Cresson, 1928, Mem. Am. Entomol. Soc. 5:59 (list).

Andrena costillensis indecisa Cockerell, 1937, Can. Entomol. 69:34 female (key).

Andrena indecisa, Buckell, 1949, Proc. Entomol. Soc. B. C. (1948) 45:27-30 (record).

Andrena (Cnemidandrena) columbiana, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1062.

Andrena (Cnemidandrena) costillensis indecisa, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1068 (synonomy).

FEMALE. *Measurements and ratios.* – N = 20; length, 7.8-9.7 mm; width, 2.4-3.4 mm; wing length, M = 3.64 ± 0.366 mm; FL/FW, M = 0.99 ± 0.079; FOVL/FOVW, M = 3.06 ± 0.175.

Integumental color. – Black except as follows: antenna red-brown beneath beyond second flagellar segment; mandible with apical half red; tibial spurs light yellow; mediotarsi, distitarsi and basal half of tarsal claws red tinged with yellow; apical half of tarsal claws red; tegulae, wing veins dark brown; pterostigma yellow; wing membrane moderately darkened apically, lightly to moderately darkened throughout; metasomal terga with apical depressed area hyaline; pygidial plate dark red-black; sterna widely hyaline apically.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 longer than flagellar segments 2 plus 3; flagellar segment 2 very slightly shorter than flagellar segment 3. Eye less than 4 times longer than wide, with inner margin weakly diverging above except for upper end incurved. Malar space 9 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum with notch of mandible tooth equidistant between middle of labrum and mandible apex; ventrobasal angle and lamella well developed. Galea moderately tessellate, dorsal surface one-fourth wider than lateral surface. Maxillary palpus reaching a little beyond apex of galea; segmental ratio 0.8 : 1.2 : 0.8 : 0.8 : 0.7 : 0.7. Labial palpus with basal segment laterally compressed and curved; apical, subapical segment attached subapically, segmental ratio 1.4 : 0.7 : 0.7 : 0.7. Labral process with broad, lower, median bulge, emarginate area weakly reflexed, twice as wide as long, depth of apical emargination equal to one-fourth length of labral process. Clypeus weakly protuberant, extending below eyes for a little more than two-fifths its length, with narrow, median, longitudinal, impunctate area; large punctures laterally separated by less than one-half diameter, punctures much smaller near upper and lateral periphery; upper third moderately shagreened, remainder shiny. Supraclypeal area with crowded, medium-sized punctures and moderate shagreening. Genal area nearly twice as wide as eye, with small punctures separated by 1 diameter, narrow area near eye shiny, remainder shagreened, shagreening most dense posteriorly. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized, deep punctures separated by 1 diameter or more, with moderate tessellation. Supra-antennal area with longitudinal rugulae and close interrugal punctures. Facial fovea 3 times longer than wide, widest and rounded above; narrowing, more pointed below; reaching above to a line just above median ocellus; reaching below to a line equidistant between antennal fossa and clypeus.

Pronotum with humeral angle and ridge weakly to moderately developed; humeral ridge narrowly depressed where crossed by pronotal suture, with indistinct, scattered punctures above, whole area moderately shagreened. Scutum with strong tessellation obscuring indistinct punctures, dull; median mesoscutal line very well developed. Scutellum with posterior half with medium-sized punctures nearly obscured posteriorly by moderate tessellation; tessellation decreasing anteriorly, anterior third with few, scattered punctures, nearly smooth, shiny. Metanotum with roughened, moderate tessellation,

punctures indistinct. Propodeal enclosure with very narrow, anterior median area of weak rugulae, moderately tessellate throughout with a broad, median, longitudinal depression; dorsoposterior area with medium-sized punctures separated by 1.5 diameters, moderately tessellate; lateral corbicular area with medium-sized, widely spaced punctures in anterodorsal third, with weak tessellation dorsally becoming reticular shagreening ventrally. Mesepisternum with large punctures irregularly spaced, moderately tessellate. Metepisternum with light, reticular shagreening, nearly shiny. Mesobasitarsus widest medially, 2.5 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest medially in basal half, a little less than 3 times longer than wide, five-sixths width of metatibia. Metatibia widest apically, curved ventrally, more than 3 times longer than wide. Wing with pterostigma 4 times longer than wide; vein 1st m-cu meeting second submarginal cell a little less than one-third distance from apex of cell.

Metasomal terga 1 to 4 with disc with small punctures separated by 1 to 3 diameters but closer apically on discs, with weak tessellation; tergum 5 similar but punctures slightly larger, more prominent. Pygidial plate slightly recurved, very narrowly rounded apically, with lateral edges and broad, median area raised, basal half with small, crowded punctures, anterior half smooth, dull. Sternum 1 with small, apical, V-shaped, median emargination, sterna 1 to 6 with small to nearly medium-sized punctures, separated by 2 or more diameters in apical half but punctures absent or nearly so in basal half or more; punctures more prominent on sternum 1; sterna very lightly shagreened, shiny.

Vestiture. – Light yellow except for metasomal terga 5 and 6 with hairs dark brown and some brownish hairs on sterna 5 and 6. Clypeus with longitudinal, median, impunctate area naked. Scutum medially with sparse, short hairs. Scutellum with nearly shiny area naked. Propodeal corbicula with scattered, long, erect hairs in anterodorsal third, outer hairs branched, inner hairs simple. Metasomal tergum 1 with apical fascia of nearly flat to nearly erect hairs not obscuring tergal surface; terga 2 to 4 with fasciae of recumbent hairs, fasciae obscuring one-third or more of terga; remainder of discs of terga 1 to 4 with erect hairs, longest on tergum 1, becoming shorter posteriorly. Tergum 5 with surface nearly obscured by posteriorly directed hairs. Sternum 1 with long, erect, scattered hairs, sterna 1 to 5 with well developed apical fringes of 1 row of very short, branched hairs, subapical fimbriae with long hairs laterally on sterna 2 to 5, shorter, scattered hairs on remaining punctured areas.

MALE. *Measurements and ratios.* – N = 20; length, 6.5-9.0 mm; width, 1.8-2.3 mm; wing length, M = 3.21 ± 0.148 mm; FL/FW, M = 0.95 ± 0.022; FS1/FS2, M = 1.39 ± 0.083.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond first flagellar segment; mandible with apical third red; mesosoma, metasomal terga, and sterna as in female with apex of disc with light red-yellow tinge.

Structure. – Scape equal to flagellar segments 1 plus 2 plus half of flagellar segment 3; flagellar segment 2 equal to flagellar segment 3. Eye slightly longer than 3 times width with inner margin moderately diverging above except for upper end slightly incurved. Malar space, mandible and galea as in female except mandible projecting a little further past middle of labrum, and without ventrobasal angle or lamella. Maxillary palpus with almost whole of apical segment projecting beyond apex of galea; segmental ratio 0.8 : 0.9 : 0.6 : 0.8 : 0.7 : 0.7. Labial palpus as in female except segmental ratio 1.2 : 0.6 : 0.5 : 0.7. Labral process very strongly reflexed, length of reflexed area about half width of process ; depth of apical emargination half length of reflexed area. Clypeus nearly flat, extending below eyes for two-fifths its length, with large punctures separated by one-half diameter except more widely separated medio-ventrally; very narrow upper peripheral area lightly shagreened. Supraclypeal area with close, irregular, medium-sized punctures, moderately shagreened. Genal area less than twice as wide as eye, with irregularly spaced, small to medium-sized punctures; posterior half shagreened, anterior half shiny. Vertex and supra-antennal area except rugulae obscure near eye.

Pronotum with humeral angle and ridge well developed except humeral ridge broadly and shallowly depressed medially; pronotal suture reaching humeral ridge; area above pronotal suture to humeral angle and ridge with longitudinal rugulae, shiny, area below pronotal suture nearly shiny or shiny; pronotum dorsally with small, obscure punctures, area above humeral ridge moderately shagreened. Remainder of mesosoma as in female except as follows: scutellum with anterior half shiny; lateral area of pronotum with moderate tessellation obscuring widely spaced punctures in dorsal half.

Metasomal terga 1 to 5 with small punctures on disc, separated by 3 diameters, but closer apically on disc, with very weak tessellation; except tergum 5 with punctures larger, more prominent. Sternum

1 with small, apical, median, V-shaped emargination; sterna 1 to 6 with small punctures separated by 3 to 5 diameters or more; with reticular shagreening, nearly shiny. Sternum 7 (fig. 33) with basal apodemes of equal width throughout; inner posterior margin indented; apex weakly pointed with long hairs. Sternum 8 (fig. 34) with apex and neck region longer than basal region; neck narrow, apex weakly expanded, neck with abundant, long hairs. Gonoforceps (figs. 30 to 32) in dorsal and lateral views ridged longitudinally, rounded apically. Penis valves with rounded, lateral expansion, apex lobe-like, strongly bent downward, extending well below gonoforceps.

Vestiture. – Light yellow throughout. Clypeus with moderately dense hairs. Scutum and scutellum with moderately dense, moderately long, erect hairs, except scutellum with hairs sparse on shiny, anterior area. Metasomal terga 1 to 5 with apical fasciae nearly obscuring a little less than one-half terga, except tergum 1 with apical fascia poorly formed, not obscuring surface, hairs nearly erect; fasciae of terga 2 to 5 with hairs more recumbent; remainder of discs with hairs erect, longest on tergum 1, becoming shorter on more posterior terga. Sternum 1 with long, erect, sparse hairs, sterna 1 to 5 with poorly formed apical fringe, remainder of sterna 2 to 6 with long, erect hairs laterally, shorter, erect hairs more anteriorly.

Variation. – In most females the longitudinal, impunctate, median line on the clypeus is not as well defined as described. The facial fovea varies in width above. In both sexes the vestiture may range from quite yellow to nearly white, (except for the dark brown vestiture of metasomal terga 5 and 6 in females) but the vestiture of some individuals is more white than yellow.

Type material. – The holotype female of *A. columbiana* (ANSP no. 4,038) was taken at Mission, British Columbia, by R. V. Harvey on August 8, 1904. The holotype female of *A. costillensis indecisa* (CNC no. 4,170) was taken at Beaverlodge, Alberta, by E. H. Strickland on July 19, 1931.

Parasites. – One female from Nahcotta, Pacific Co., Washington, is carrying one female stylops. One female from 10 mi. S.E. Laramie, Albany Co., Wyoming, carries one triungulin on metasomal tergum 1.

Range and localities. – *Andrena columbiana* ranges farther north than any other species of North American *Cnemidandrena.* The northern limit is southern Alaska, southern Yukon and, southern North West Territory. It extends east to Saskatchewan and south to New Mexico and to all states west of this line except Arizona (map 4). A total of 378 females and 148 males were examined. Altitude records range from 937 m to 3,937 m. All collection localities including published records are given below.

ALASKA. Big Delta.

ALBERTA. Banff, Beaverlodge, Calgary, Lethbridge, Magrath, Medicine Hat, Waterton.

BRITISH COLUMBIA. Agassiz, Atlin, Cranbrook, Crescent, Glenora, Invermere, Keremeos Twin Lake, Manning Park Pinewoods, Merrit, Midday Valley, Mission, Revelstoke, Sidney, Squamish Diamond Head Trail, Vancouver, Victoria.

CALIFORNIA. Glen Blair. *Alpine Co.:* Carson Pass, Forestdale Meadow, Mineral King, Winnemucca Lake, Woods Lake. *Del Norte Co.:* Crescent City. *El Dorado Co.:* Echo Lake, Silver Lake, Strawberry Valley. *Fresno Co.:* Florence Lake, Huntington Lake, Marie Lake. *Humboldt Co.:* Mouth of Redwood Creek, Orick, Trinidad. *Inyo Co.:* Mono Pass, near Mono Pass, Ruby Lake. *Kern Co.:* Walker Pass. *Mono Co.:* Colville, Duck Lake, Mammoth, Mammoth Lake, Mountain S.W. Red Lake, Sardine Creek, Sonora Pass, Sonora Pass McKay Creek, 2 km S. Toms Place, 2 km W. Toms Place, White Mountains, White Mountains Crooked Creek Lab. *Placer Co.:* Donner Lake. *San Mateo Co.:* Montara. *Sierra Co.:* Gold Lake, Weber Lake. *Tulare Co.:* Crabtree Meadow, Mineral King, Wallace Lake. *Tuolumne Co.:* Kennedy Meadow, Sonora Pass, Sonora Pass Blue Canyon, Tuolumne Meadows.

COLORADO. *Boulder Co.:* Capeland Park, Peaceful Valley, Rainbow Valley, Ward. *Clear Creek Co.:* Georgetown. *Gilpin Co.:* Lump Gulch near Gilpin. *Gunnison Co.:* Black Mesa 28 km W. Sapinero. *Jackson Co.:* Gould. *Jefferson Co.:* Morrison. *Lake Co.:* Leadville. *Larimer Co.:* Cameron Pass, Pingree Park. *Mineral Co.:* Creede. *Montrose Co.:* Long Park Trail, 40 km S.W. Montrose Iron Springs Camp, Ute Creek. *Pitkin Co.:* Aspen, Tennessee Pass. *Routt Co.:* Steamboat Springs, 24 km E. Steamboat Springs. *Teller Co.:* Cripple Creek, Florissant Big Springs Ranch, Florissant South Base Blue Mountains, Pikes Peak.

IDAHO. *Custer Co.:* 32-40 km N.E. Stanley. *Valley Co.:* 24 km E. McCall.

MONTANA. *Gallatin Co.:* Three Forks. *Lewis and Clark Co.:* Helena.

NEVADA. *Douglas Co.:* Lake Tahoe.

NEW MEXICO. *San Miguel Co.:* Top of Range Rivers between Sapello and Pecos. *Socorro Co.:* Magdalena Mountains.

NORTH WEST TERRITORY. Fort Smith.

OREGON. *Clackamas Co.:* Mt. Hood. *Coos Co.; Curry Co.:* Gold Beach. *Deschutes Co.:* 8 km W. Sisters, Sparks Lake. *Klamath Co.:* 11 km Creek near Fort Klamath, Upper Klamath Marsh. *Lane Co.:* Three Sisters, Three Sisters Scott Lake. *Lincoln Co.:* Yachats. *Tillamook Co.:* Sand Lake. *Wallowa Co.:* Joseph, Wallowa Lake, Lake Basin Trail.

SASKATCHEWAN. Rutland.

UTAH. Allen Canyon. *Cache Co.:* Logan Canyon, White Pine Lake near Logan. *Kane Co.:* 6 km S.E. Mount Carmel. *Sanpete Co.:* 27 km E. Mayfield.

WASHINGTON. *Island Co.:* Coupville. *King Co.:* Seattle. *Pacific Co.:* Bay Center, Nahcotta, Ocean Park, Oyster Bay, Seaview. *Pend Oreille Co.:* Metaline Falls. *San Juan Co.:* Friday Harbor. *Whatcom Co.:* Mount Baker Lodge. *Yakima Co.:* American River, Chinook Pass.

WYOMING. *Albany Co.:* 16 km S.E. Laramie, 45 km E. Laramie, Laramie River, Snowy Range Mountains. *Fremont Co.:* Sinks Canyon, South Pass City. *Park Co.:* Squaw Lake Yellowstone National Park. *Sweetwater Co.:* Green River Lake.

YUKON TERRITORY. Dawson, Whitehorse.

Flight records. – Females of this species have been taken from June 4 to September 14, and males have been taken from June 6 to September 6, with about 80 percent of all specimens taken in the last half of July and the first half of August.

Floral records. – As pollen sources, females prefer the flowers of species within the Astereae. For *A. columbiana* a total of 48 females and 6 males have been taken from the flowers of the following plants: 1 female, *Achillea millefolium* (P,N); 17 females, 2 males, *Aster* sp., (P,N); 1 male, *Cleome serrulata;* 1 male, *Erigeron* sp.; 3 females, 1 male, *E. nevadensis pygmaeus* (P,N); 17 females, *Grindelia* sp., (P,N); 2 females, *Haplopappus* sp., (N); 1 female, *H. suffluticosa* (N); 1 female, *Heracleum* sp., (N); 1 female, *Macharanthera varians* (P,N); 1 male, *Melilotus* sp.; 3 females, *Solidago* sp., (P,N); 2 females, *Sphenosciadium capitellatum* (P,N, but this pollen is mostly compositae pollen).

Females of *A. columbiana* are readily distinguished from those of *A. costillensis* and *A. pachucensis* by the vestiture of metasomal terga 5 and 6 brown, and thus not concolorous with the white-yellow vestiture of the rest of the insect. Males are very difficult to separate from those of *A. costillensis,* and many males placed in *A. columbiana* may actually belong to *A. costillensis.* These two species appear to be very closely related.

Andrena (Cnemidandrena) pachucensis Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 2; length, 8.0-8.8 mm; width, 2.1-2.8 mm; wing length, 2.8-2.9 mm; FL/FW, 1.0; FOVL/FOVW, 3.33.

Integumental color. – Black except as follows: antenna beyond second flagellar segment brown-yellow; mandible with a little more than apical half red; tibial spurs yellow; mediotarsi, distitarsi and basal half of tarsal claws orange-yellow; tegula hyaline brown, wing veins and pterostigma dark brown-black; wing membrane with apical margin weakly clouded apically; metasomal terga and sterna widely hyaline apically; pygidial plate black-red apically.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 a little longer than flagellar segments 2 plus 3; flagellar segment 2 equal to flagellar segment 3. Eye nearly 4 times longer than wide with inner margin moderately diverging above except for upper end incurved. Malar space 7 times wider than long. Mandible in repose extending for one-fourth its length beyond middle of labrum, notch of mandible tooth one-third of distance between middle of labrum and mandible apex from middle of labrum. Galea moderately and finely tessellate, dorsal surface equal in width to lateral surface. Maxillary palpus projecting just beyond apex of galea; segmental ratio 0.8 : 0.8 : 0.6 : 0.6 : 0.4 : 0.5. Labial palpal basal segment compressed, curved laterally, apical segment attached somewhat subapically, segmental ratio 1.2 : 0.7 : 0.4 : 0.5. Labral process twice as wide as long, narrowing apically, apical emarginate area slightly reflexed, apical emargination deep, depth one-third length of labral process. Clypeus weakly protuberant, extending below eyes for two-fifths its length, with large, close punctures, punctures smaller, closer laterally, upper periphery with mod-

erate shagreening obscuring punctures; narrow, lower, median area with transverse shagreening remaining area shiny. Supraclypeal area with close, medium-sized punctures obscured by moderate shagreening. Genal area slightly more than 1.5 times wider than eye, with small to medium-sized punctures separated by less than 1 diameter near eye, more widely spaced posteriorly, posterior two-thirds shagreened, anterior third near eye shiny. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized. deep punctures separated by 1 diameter, with reticular shagreening. Supraantennal area longitudinally rugulate with medium-sized, interrugal punctures separated by 1 diameter. Facial fovea 3 times longer than wide, widest above, narrowing below, rounded above and below; reaching above to a line above median ocellus, reaching below to a line equidistant between antennal fossa and clypeus.

Pronotum with humeral angle and ridge well developed, with humeral ridge slightly depressed where reached by pronotal suture; with medium-sized punctures above humeral ridge, punctures widely spaced; whole area moderately shagreened. Scutum with similar punctures but separated by 1.5 to 3 diameters, with moderate shagreening except shagreening becoming very light on dorsal, median area, this area nearly shiny. Scutellum with anterior two-thirds smooth, very shiny, except for 1 or 2 medium-sized, widely spaced punctures, remainder with medium-sized punctures separated by 1 diameter, shagreened. Metanotum with medium-sized punctures separated medially by 3 or more diameters, closely spaced laterally. Propodeal enclosure with anterior half irregularly roughened, posterior half with moderate tessellation and a shallow, median, longitudinal depression; dorsoposterior area with large punctures separated by 1 diameter, shagreened; corbicular areas with medium-sized, scattered punctures in anterior third, with weak, reticular shagreening, surface nearly shiny. Mesobasitarsus widest medially, 2.5 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest medially in basal third, 2.6 or more times longer than wide, a little wider than metatibia. Metatibia cuneate, curved ventrally, widest apically, 4 times longer than wide. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell a little more than one-third basal length of cell from cell apex.

Metasomal terga 1 and 2 with apical margin shallowly emarginate, that on tergum 2 very shallow; terga 1 to 4 with discs with medium-sized punctures separated by 2 diameters except punctures closer apically on discs, with moderate to light tessellation. Tergum 5 with large punctures on disc separated by 1 or more diameters, with weak tessellation. Pygidial plate with apex narrowly rounded, upturned. Sternum 1 with apical, V-shaped emargination, with medium-sized punctures separated by 2 diameters or less. Sterna 2 to 6 with small to medium-sized punctures and weak shagreening.

Vestiture. – White except mesosoma dorsally with pubescence light yellow; metatibia and tarsi with hairs golden. Clypeus with pubescence less dense medially. Scutum with hairs shorter, sparser medially. Scutellum with hairs very sparse on impunctate, anterior area. Corbicular area with widely spaced, long, plumose hairs in anterodorsal third. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with apical fasciae of recumbent hairs, fasciae obscuring more than half terga; tergum 1 with long, erect hairs on remainder of disc; tergum 2 with long, erect hairs medially, lateral hairs short, erect; terga 3 and 4 with short, erect hairs on disc. Tergum 5 not obscured by long, posteriorly directed hairs. Sternum 1 with long, sparse, erect hairs, apical fringe well developed. Sterna 2 to 5 with subapical fimbriae well developed laterally, weak medially; apical fringes moderately developed, remainder of sternal surface with short, erect hairs.

MALE. *Measurements and ratios.* – N = 7; length, 7.5-7.8 mm; width, 2.2-2.7 mm; wing length, M = 2.69 ± 0.068 mm; FL/FW, M = 0.95 ± 0.089; FS1/FS2, M = 1.16 ± 0.056.

Integumental color. – Black except as follows: antenna yellow-brown ventrally beyond first flagellar segment; mandible with apical third red; tibial spurs light yellow; mediotarsi, distitarsi, and basal half of tarsal claws yellow; apical half of tarsal claws red; tegula, wing veins, and pterostigma as in female; wing membrane with narrow, apical area slightly darkened. Metasomal terga with whole of apical, depressed area hyaline; sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 and 2 plus half of flagellar segment 3; flagellar segment 1 a little longer than flagellar segment 2; flagellar segment 2 a little shorter than flagellar segment 3. Eye a little less than 4 times longer than wide with inner margin diverging moderately above except for upper end incurved. Malar space, mandible and galea as in female except notch of mandible tooth almost half way between middle of labrum and apex of mandible, and mandible without ventrobasal lamella. Maxillary palpus with half of apical segment or slightly more projecting

beyond apex of galea; segmental ratio 0.6 : 0.8 : 0.5 : 0.6 : 0.5 : 0.6. Labial palpus as in female except segmental ratio 1.0 : 0.5 : 0.4 : 0.6. Labral process strongly reflexed, somewhat more than twice as wide as long, apical emargination deep, depth half length of reflexed area. Clypeus weakly protuberant, extending below eyes for slightly less than one-fourth its length, with large punctures except for a small, impunctate, lower median area, and punctures a little smaller, more crowded dorsally and laterally; whole area shiny. Supraclypeal area with irregular, crowded punctures imparting a roughened appearance. Genal area 1.6 times wider than eye, with medium-sized punctures separated by 1 to 2 diameters; posterior half shagreened, remainder shiny. Vertex and supra-antennal area as in female; paraocular area as for supra-antennal area except longitudinal rugulae not developed near eye.

Pronotum with humeral angle and ridge very well developed, humeral angle almost carinate, not or scarcely depressed where reached by indistinct, pronotal suture; above humeral ridge with coarse shagreening obscuring punctures, area below humeral angle and above pronotal suture with dorsoventral rugulae; area below pronotal suture smooth, shiny. Remainder of mesosoma as in female except as follows: scutum with small, dorsal area nearly or completely without shagreening, shiny; corbicular area of propodeum sculptured as for dorsoposterior areas, metepisternum weakly shagreened.

Metasomal terga 1 to 5 with medium-sized punctures on disc separated by 3 diameters except closer on apical margin of discs; moderately shagreened. Sternum 1 with median, V-shaped, apical emargination; sterna 1 to 6 with medium-sized punctures separated by 2 diameters; with light shagreening on sternum 1, remainder moderately shagreened. Sternum 7 (fig. 38) with basal apodemes rounded basally; apex rounded, shoulders with long hairs. Sternum 8 (fig. 39) with apex and neck region longer than basal region, neck with abundant, long hairs, neck widening gradually from narrow, median area. Gonoforceps (figs. 35 to 37) in dorsal view widened apically, with an oblique ridge not reaching outer edge; in lateral view nearly straight apically. Penis valves in dorsal and ventral view widest medially, apex widely lobelike; in lateral view downturned apically but shorter than gonoforceps.

Vestiture. – White throughout. Clypeus with long, dense pubescence. Scutum with pubescence sparse dorsally on nearly shiny areas. Scutellum naked on shiny area but overlain by hairs from posterior and lateral punctured areas. Metasomal terga 1 to 5 with apical fasciae of recumbent hairs, fasciae obscuring less than half of terga; remainder of discs with long, erect hairs, slightly shorter on each tergum posterior to tergum 1. Sternum 1 with long, erect, scattered hairs, sterna 1 to 6 with apical fringes moderately developed, sterna 2 to 4 with long hairs forming dense fimbriae, remaining areas of sterna with nearly erect hairs.

Variation. – The paratype female has the clypeus with a small, median ventral, impunctate area. In males the nearly shiny area dorsally on the scutum varies slightly in degree of reduction of tessellation.

Type material. – The holotype female (KU) was taken at Epazoyucan, Hidalgo, Mexico, by the University of Kansas Mexican Expedition on June 17, 1961, on flowers of *Haplopappus* sp. The allotype male (KU) was taken 8 km west of Pachuca, Hidalgo, Mexico at 2,469 m by Ellen Ordway on August 26, 1962. Paratypes are designated as follows: 1 female, same data as holotype; 3 males, same data as allotype; 5 males (KU), Pachuca, Hidalgo, Mexico, by the University of Kansas Mexican Expedition at 2,437 m on July 28, 1954.

Parasites. – None.

Range and localities. – This species has been taken from one small area of Mexico (map 2). A total of two females and nine males were examined. Three altitude records are as follows: 2,437 m, 2,469 m, and 2,531 m. All collection data are given under "Type material."

Flight records. – Females were taken on June 17, and males were taken on July 28 and August 26.

Floral records. – The holotype female and paratype female were taken on *Haplopappus* sp., and both are carrying small quantities of pollen in their scopae.

Both sexes of *A. pachucensis* have the scutum nearly shiny, a character which separates them from the otherwise similar *A. costillensis* and *A. columbiana.*

Andrena (Cnemidandrena) mentzeliae Cockerell

Andrena mentzeliae Cockerell, 1897, Entomologist 30:307 female; 1898, Univ. N. M. Bull. Biol. Ser. 1:1, 49 (key); 1906, Trans. Am. Entomol. Soc. 32:296 female (record); 1931, Am. Mus. Novit.

458:14, 15, female, male (record, key); 1934, Am. Mus. Novit. 697:3 (record); Lanham, 1941, Ann. Entomol. Soc. Am. 34:706, 708, female, male (key).

Andrena (Cnemidandrena) mentzeliae, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:200 (classification); Linsley in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1072.

FEMALE. *Measurements and ratios.* – N = 15; length, 10.3-11.4 mm; width, 3.1-3.9 mm; wing length, M = 3.54 ± 0.145 mm; FL/FW, M = 1.05 ± 0.108; FOVL/FOVW, M = 3.01 ± 0.073.

Integumental color. – Black except as follows: antenna beyond second flagellar segment light brown beneath; mandible with apical half red; tibial spurs and tarsi except basitarsi light brown; basal half of tarsal claws light yellow-brown, apical half red; tegula, submarginal vein and stigma dark brown, remaining veins light yellow-brown; wing membrane hyaline except for moderate, apical cloud; metasomal terga and sterna hyaline apically.

Structure. – Scape slightly longer than flagellar segments 1 to 3; flagellar segment 1 equal in length to flagellar segments 2 plus 3; flagellar segment 2 equal to flagellar segment 3. Eye more than 4 times as long as wide, inner margin subparallel except upper end inwardly curved. Malar space 8 times wider than long. Mandible in repose extends for one-fifth its length beyond middle of labrum; notch of mandible tooth one-third of distance between middle of labrum and mandible apex, ventrobasal angle weakly developed. Galea moderately tessellate, lateral surface narrower than dorsal surface. Maxillary palpus with apical segment projecting beyond apex of galea, segmental ratio 1.0 : 1.5 : 1.2 : 1.2 : 1.1 : 1.0. Labial palpus with basal segment moderately compressed, weakly curved laterally, apical segment moderately compressed, weakly curved laterally, apical segment attached subapically, segmental ratio 1.9 : 1.0 : 0.8 : 0.9. Labral process moderately reflexed, wide basally, 3 times wider than long; depth of median emargination equal to one-third length of labral process. Clypeus projecting below eyes for almost one-half its length, moderately protuberant; large punctures dorsolaterally separated by 1 diameter, more widely spaced towards median third, median third impunctate, whole surface smooth, polished, except for very narrow dorsolateral periphery shagreened. Supraclypeal area with shallow, crowded punctures, shiny. Genal area twice as wide as eye with small punctures separated by 2 to 3 diameters; third next to eye smooth, shiny, remainder heavily shagreened. Vertex above lateral ocellus equal to 1 ocellar diameter, densely tessellate with deep punctures less than one-half diameter apart. Supra-antennal area with strong, longitudinal rugulae obscuring weak punctures. Facial fovea rounded above and below, wider above, narrowing below, reaching above to a line halving lateral ocellus, reaching below to a line just below antennal fossa.

Pronotum with humeral angle and ridge moderately developed but humeral ridge depressed where crossed by pronotal suture; surface dulled throughout by reticular shagreening. Scutum, posterior half of scutellum, metanotum, dorsoposterior surface of propodeum, with coarse, dense tessellation obscuring irregular punctures, dull. Anterior half of scutellum with moderate tessellation, surface nearly shiny. Propodeal enclosure with coarse tessellation, with a shallow, median, longitudinal depression and small rugulate area anteriorly. Mesepisternum moderately tessellate with obscure punctures. Metepisternum, lateral corbicular area of propodeum with weak tessellation; corbicular area of propodeum with a few punctures in anterior fourth. Mesobasitarsus not markedly expanded medially, somewhat less than 3 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest basally, 4 times longer than wide. Metatibia 3 times longer than wide, more than one-fourth as wide as metabasitarsus. Wing with pterostigma 5 times longer than wide; vein 1st m-cu meets second submarginal cell well beyond middle.

Metasomal terga 1 to 4 strongly tessellate except depressed margins less so, discs with obscure punctures separated by 4 to 5 diameters but punctures closer on posterior margin of discs. Tergum 5 similar but punctures more distinct. Pygidial plate rounded apically, sides slightly raised, posterior half smooth, dull, basal half with small, close punctures. Sternum 1 with apical, median, V-shaped emargination, median area with prominent punctures separated by 3 diameters; sternum 2 with broad, shallow, median emargination. Sterna 2 to 6 with punctures slightly less prominent, separated by 3 diameters; sterna 1 to 6 with weak, reticular shagreening.

Vestiture. – Yellow-white except dorsal pubescence of thorax brown-yellow. Clypeus naked except for periphery with few hairs. Propodeal corbicula with sparse hairs in anterodorsal fourth. Metasomal terga 1 to 4 with apical fasciae of appressed hairs obscuring one-third terga. Tergum 1 with long, erect hairs on disc throughout; tergum 2 with shorter, erect hairs on median third of disc; lateral thirds of disc of tergum 2 and discs of terga 3 and 4 with short, erect hairs. Tergum 5 with short hairs inclined to posterior, becoming longer and more dense posteriorly. Sterna 1 to 6 with short, erect hairs

throughout except for long, erect hairs of subapical fimbriae and apical fringes; subapical fimbriae well developed laterally, poorly developed medially, apical fringes moderately dense.

MALE. *Measurements and ratios.* – N = 12; length, 8.6-10.4 mm; width, 2.4-3.4 mm; wing length, M = 5.92 ± 0.197 mm; FL/FW, M = 1.01 ± 0.014; FS1/FS2, M = 1.61 ± 0.142.

Integumental color. – Black except as follows: antenna beyond first flagellar segment red-brown beneath; mandible with apical third deep red; tegula and wing as in female except wing membrane slightly less clouded apically; legs as in female; metasomal terga and sterna very widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 plus 2 plus half of flagellar segment 3; flagellar segment 1 more than one and one-half times longer than flagellar segment 2; flagellar segment 2 shorter than flagellar segment 3. Eye more than 3 times longer than wide, with inner margin very slightly diverging above except upper end inwardly curved. Malar space, mandible and galea as in female except mandible without ventrobasal angle and lamella. Maxillary palpus with apical segment and half of subapical segment projecting beyond apex of galea; segmental ratio 0.7 : 1.0 : 0.9 : 1.0 : 0.9 : 0.9. Labial palpus with basal segment moderately compressed, strongly curved laterally, apical, subapical segments attached subapically, segmental ratio 1.3 : 0.6 : 0.7 : 0.8. Labral process strongly reflexed, twice as wide as long or more, apical emargination broad, depth one-fourth length of labral process or more. Clypeus moderately protuberant, evenly rounded from side to side, extending below eyes for two-fifths its length, with large punctures separated by one-half diameter except for median, longitudinal, impunctate strip, narrow above, broadening below, whole surface shiny. Supraclypeal area with similar punctation and light shagreening. Genal area less than 1.5 times as wide as eye, weakly produced to an angle opposite mid-point of eye; posteriorly with medium-sized punctures separated by 2 diameters, punctures decreasing in size anteriorly; posterior half moderately shagreened, anterior half shiny. Vertex, supra-antennal area as in female. Paraocular areas with moderate, longitudinal rugulae and small, close punctures.

Pronotum with humeral angle and ridge very well developed, with pronotal suture prominent, crossing humeral ridge for a short distance above humeral ridge; with medium-sized punctures separated by 2 diameters, area below humeral ridge to pronotal suture with weak, dorsoventral rugulae, remainder shagreened except narrow angle between humeral ridge and pronotal lobe shiny. Remainder of thorax as in female except scutum with punctures more prominent, separated by 1 to 2 diameters, tessellation lighter dorsally, scutellum more shiny in anterior half; propodeum with lateral face with small, widely spaced punctures in upper half.

Metasomal terga 1 to 5 with disc with small punctures, on apex separated by 2 diameters, on remainder separated by 4 or more diameters, with weak to moderate tessellation. Sterna 1 to 6 as in female. Sternum 7 (fig. 43) with basal apodemes of equal width throughout; apex broad with a moderately deep, median emargination, wide area on each side of emargination with long hairs. Sternum 8 (fig. 44) with apex and neck region much longer than basal region, apex of basal region with a small, median emargination, neck region with abundant, long hairs. Gonoforceps (figs. 40 to 42) in dorsal view strongly ridged; inner apical margin shallowly emarginate. Penis valves in dorsal and ventral view very broadly expanded basally, narrowing strongly to slightly bulbous apex; in lateral view penis vlaves strongly downcurved.

Vestiture. – Color as in female. Clypeus nearly obscured by long hairs except hairs less dense along narrow median line. Scutum, scutellum with long, erect, moderately dense hairs. Metasomal terga 1 to 5 with apical fasciae present on less than half tergal area; fascia of tergum 1 of long, nearly erect hairs, not wholly obscuring surface beneath, fasciae of terga 2 to 5 of shorter, dense, recumbent hairs, completely obscuring tergal surfaces beneath; tergum 1 with remainder of disc with long, erect hairs, tergum 2 with shorter, erect hairs medially, short, erect, sparse hairs laterally, terga 3 to 5 with short, erect, sparse hairs. Sterna 1 to 5 with apical fringes of moderately long, moderately dense hairs except sternum 1 with hairs shorter, remaining sternal area with long, sparse, erect hairs, hairs shortest anteriorly.

Variation. – In both sexes variation is shown in the degree of expression of the median longitudinal depression in the propodeal enclosure.

Type material. – The holotype female (NMNH no. 18,930) was collected at Santa Fe, Santa Fe Co., New Mexico, on flowers of *Mentzelia nuda* on August 3, 1897, by T. D. A. Cockerell. The neallotype male (NMNH) (here designated) was taken at Pecos, San Miguel Co., New Mexico, on July 25 (no year given), on flowers of *Touteria rusbyi*, by T. D. A. and W. P. Cockerell.

Parasites. – One female from southeast of Raton, Colfax Co., New Mexico, carries one female stylops. One female from Glen, Sioux Co., Nebraska, has one triungulin clinging to the anterior dorsal hairs of the scutum.

Range and localities. – Few specimens of this species were available. The collection localities for both published and unpublished data show that this species has been taken only in three states; Nebraska, Colorado, and New Mexico (Map 5). A total of 16 females and 11 males were examined. Altitude records given are 1,406 m, 1,468 m, and 1,848 m.

COLORADO. *Arapahoe Co.:* Denver. *Baca Co.:* 10 km N.W. Springfield. *Boulder Co.:* Boulder. *El Paso Co.:* Colorado Springs, 11 km W. Colorado Springs. *Jefferson Co.:* Buffalo Creek, Jim Creek near Boulder. *Larimer Co.:* Fort Collins. *Mesa Co.:* Grand Junction. *Pueblo Co.:* Pueblo.

NEBRASKA. *Chase Co.:* 16 km S.W. Imperial. *Sioux Co.:* Glen.

NEW MEXICO. *Colfax Co.:* S.E. of Raton. *San Miguel Co.:* Pecos. *Santa Fe Co.*

Flight records. – Females have been taken from July 27 to October 2, and males have been taken from July 25 to August 16. Except for one record for females for September 2, all other specimens of both sexes were taken in August.

Floral records. – 1 male, *Curcurbita* sp.; 2 females, *Mentzelia* sp., (P,N); 1 female, *M. decapetala,* (P,N); 1 female, 1 male, *M. multiflora,* (P,N); 2 females, *M. nuda,* (P,N); 1 male, *Touterea rusbyi.*

Females are oligolectic on flowers of the genus *Mentzelia* within the family Loasaceae, and are thus separated ecologically from the remainder of North American *Cnemidandrena* for which pollen sources are known. Females are morphologically separated from other *Cnemidandrena* by the large, protuberant, naked, shiny clypeus, and the males by the penis valves very widely expanded basally. The wide ecological and morphological separation of this species suggests that it separated from the rest of *Cnemidandrena* at an early stage before the remaining species differentiated.

Andrena (Cnemidandrena) scutellinitens Viereck

Andrena (Andrena) scutellinitens Viereck, 1916, Proc. Acad. Nat. Sci. Phila. 68:573 female, male; Lanham, 1949, Univ. Calif. Publ. Entomol. 8:200 (referred to *Pterandrena*); LaBerge, 1967, Univ. Nebr. State Mus. Bull. 4:294 (referred to *Cnemidandrena*).

Andrena (Pterandrena) scutellinitens, Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1080.

FEMALE. *Measurements and ratios.* – N = 20; length, 7.8-8.9 mm; width, 2.2-2.8 mm; wing length, M = 2.54 ± 0.104 mm; FL/FW, M = 1.09 ± 0.104; FOVL/FOVW, M = 3.10 ± 0.211.

Integumental color. – Black except as follows: antenna medium brown ventrally beyond second flagellar segment; mandible with apical half bright red; tegula, wing veins and pterostigma light yellow-brown; wing membrane hyaline except for medium darkening apically, darkening most pronounced just beyond marginal cell; tibial spurs nearly white; tarsal claws with basal half yellow, apical half red; metasomal terga and sterna with median width of apical margin hyaline; pygidial plate red.

Structure. – Scape equal in length to flagellar segments 1 to 3; flagellar segment 1 equal to flagellar segments 2 plus 3. Eye less than 4 times longer than wide with inner margin diverging above except for upper end incurved. Malar space 7 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum; notch of mandible tooth slightly less than half way between middle of labrum and mandible apex. Galea moderately tessellate, lateral surface equal in width to dorsal surface. Maxillary palpus reaching just to apex of galea, segmental ratio 0.8 : 0.9 : 0.9 : 0.8 : 0.7 : 0.7. Labial palpus with basal segment moderately flattened laterally, curved, apical segment attached subapically, segmental ratio 1.3 : 0.8 : 0.7 : 0.7. Labral process flat, 3 times wider than long, median emargination broad, depth one-third length of labral process. Clypeus strongly protuberant, extending below eyes for less than one-half its length, dorsal and lateral periphery shagreened, remaining area with large punctures separated by less than 1 diameter except for large, ventral median area with punctures widely separated, leaving an irregular impunctate area; non-shagreened area shiny. Supraclypeal area densely shagreened with crowded, medium-sized punctures. Genal area 1.5 times wider than eye, with small punctures separated by 3 diameters, one-fourth of area near eye smooth, shiny, remainder shagreened, dull. Vertex above lateral ocellus equals more than 1 ocellar diameter,

with moderate, irregular tessellation obscuring medium-sized, deep punctures separated by 1 diameter or less. Supra-antennal area with longitudinal rugulae and irregular punctures between the rugulae. Facial fovea rounded above and below, broad above, narrowing below, reaching above to a line above median ocellus, below to a line equidistant between upper limit of clypeus and lower edge of antennal fossa.

Pronotum with humeral angle well developed, humeral ridge moderately developed below, but broadly depressed medially where crossed by pronotal suture; pronotum with moderate, reticular shagreening throughout. Scutum with light tessellation in anterior third, remainder nearly smooth with large, shallow punctures separated by 1 to 2 diameters, punctures tessellate internally. Scutellum with anterior two-thirds polished, shiny, remainder lightly tessellate, dull. Metanotum, dorsoposterior face of propodeum with moderate tessellation obscuring medium-sized punctures, punctures crowded on posterior margin of metanotum, 3 diameters apart on dorsoposterior face of propodeum. Propodeal enclosure with irregular rugulae except for a small, narrowed posterior area with moderate tessellation. Mesepisternum densely shagreened with medium-sized punctures separated by 2 to 3 diameters. Metepisternum with very light, reticular shagreening, shiny. Corbicular area of propodeum with reticular shagreening and widely spaced, medium-sized punctures in anterodorsal third. Metabasitarsus widest in proximal half, 3.5 times longer than wide, outer edge nearly straight, inner edge convex. Mesobasitarsus 2.3 times longer than wide, somewhat less than one-third wider than metabasitarsus. Metatibia nearly 4 times longer than wide, more than two-thirds wider than metabasitarsus. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-third distance from apex. Metasomal terga 1 to 4 with discs finely tessellate anteriorly, becoming shagreened posteriorly; hyaline area nearly shagreened basally, smooth apically. Tergum 1 with disc with small punctures separated by 3 diameters except closer posteriorly; terga 2 to 4 with very small, indistinct punctures on disc separated by 3 to 4 diameters, becoming longer and separated by 1 diameter posteriorly. Tergum 5 with weak, median longitudinal ridge; with reticular shagreening and large punctures separated by 1 diameter or less. Pygidial plate recurved, rounded apically, whole surface shagreened, median longitudinal third and sides raised. Sternum 1 with apical margin with a very shallow, median emargination; sterna 1 to 6 shagreened except for large, nearly smooth, central basal areas on sterna 3 to 6. Sternum 1 with medium-sized punctures separated by 2 diameters, sterna 2 to 6 with small punctures on shagreened areas separated by 2 to 3 diameters.

Vestiture. – Facial hair except for facial fovea light yellow; clypeus broadly naked medioventrally, hairs becoming more numerous toward dorsolateral periphery; facial fovea with white-brown hairs. Mesosoma with yellow hairs dorsally, hairs more white ventrally; scutum with short hairs medially, scutellum with anterior half naked; propodeal corbicula with long, widely spaced hairs in anterodorsal third. Trochanteral floccus imperfect. Legs with hairs to femur white except metafemur with apical fimbria dark brown; tibial and tarsal hairs golden, except outer basal hairs of tibial scopa light brown to black. Metasomal terga 1 to 4 with apical fasciae of dense, nearly appressed white-yellow hairs, obscuring less than half terga; fascia of tergum 1 narrower with hairs less appressed than fasciae of terga 2 to 4. Tergum 1 with long, erect, yellow hairs laterally and anteriorly on disc; median area nearly naked; tergum 2 with apical fascia wider medially with anterior hairs erect but much shorter than those on tergum 1. Terga 3 to 4 with very fine, short, sparse, pale hairs in about median thirds. Tergum 2 with extremely short, erect, brown-black hairs laterally, tergum 3 similar but brown-black hairs longer but still short and present on about lateral thirds. Tergum 5 obscured by long, reclining, brown to black hairs. Sternum 1 with erect, yellow hairs throughout; sterna 2 to 5 with subapical fimbriae of long, nearly erect, white-yellow hairs in about lateral thirds, and shorter brown hairs laterally on discs. Sterna 2 to 6 with apical fringes of short, nearly appressed, white hairs.

MALE. *Measurements and ratios.* – N = 20; length, 5.9-7.8 mm; width, 1.7-2.2 mm; wing length, M = 2.14 ± 0.134 mm; FL/FW, M = 1.09 ± 0.110; FS1/FS2, M = 1.43 ± 0.060.

Integumental color. – Black except as follows: antenna slightly lighter ventrally beyond first flagellar segment; mandible with apical third deep translucent red; tibial spurs nearly white; tarsi brown-yellow, basal half of tarsal claws yellow, apical half red; metasomal terga broadly hyaline apically; sterna more narrowly hyaline.

Structure. – Scape twice as long as flagellar segment 1; flagellar segment 2 two-thirds length of flagellar segment 1. Eye less than 3.5 times longer than wide, with inner margins diverging above except for upper ends subparallel. Malar space, mandible and galea as in female except mandible with-

out ventrobasal lamella. Maxillary palpus with almost whole of apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.9 : 0.7 : 0.5 : 0.7 : 0.7. Labial palpus as in female except segmental ratio 1.3 : 0.6 : 0.7 : 0.9. Labral process moderately recurved, twice as wide as long, median emargination deep, depth half length of labral process. Clypeus moderately protuberant, extending below eyes for half its length, with large punctures, crowded on upper periphery but separated by 2 or more diameters medioventrally, surface shiny. Supraclypeal area as in female except shagreening weak. Gena 1.3 times wider than eye, rounded posteriorly to weakly angulate opposite mid-point of eye, with median punctures separated by 1 diameter; posterior half shagreened; anterior half shiny. Vertex as in female. Supra-antennal and paraocular areas with longitudinal rugulae and large, irregular interrugal punctures.

Pronotum with humeral angle and ridge moderately developed, humeral ridge not depressed where reached by weak pronotal suture; posterior margin above pronotal suture expanded laterally; whole area strongly shagreened except shagreening weak and surface nearly shiny below pronotal suture. Remainder of thorax as in female except as follows: unshagreened areas of scutum, scutellum, shinier; propodeum except propodeal enclosure densely and roughly shagreened, with medium-sized punctures separated by 1 diameter. Mesepisternum with large, deep punctures separated by 1 diameter, whole area with dense shagreening, dull. Metepisternum impunctate, polished.

Metasomal terga 1 and 2 moderately shagreened; terga 3 to 5 smooth, terga 1 to 5 with small punctures separated by 2 diameters, punctures slightly larger on tergum 5. Sternum 1 with deep, V-shaped, median apical emargination; sterna 1 to 6 shagreened throughout, sternum 1 with medium-sized punctures separated by 1 diameter, sterna 2 to 6 with smaller punctures separated by 1 to 2 diameters. Sternum 7 (fig. 48) with basal apodemes narrowing very slightly and rounded basally, apex with small, shallow, median emargination and areas lateral to emargination with long hairs. Sternum 8 (fig. 49) with apex and neck region much longer than basal region; apex not markedly expanded; neck with long hairs. Gonoforceps (figs. 45 to 47) in dorsal view ridged longitudinally. Penis valves in dorsal and ventral views with a very weak, lateral expansion; apex rounded, not lobed, in lateral view strongly bent downwards.

Vestiture. – Yellow-white throughout except as follows: clypeus with abundant pubescence but pubescence less abundant medially. Scutum with moderately long, erect, sparse hairs, scutellum naked except long, erect hairs on posterior margin. Apical fascia of tergum 1 of long, yellowish hairs appressed posteriorly, nearly erect anteriorly; fascia less compact than remaining fasciae; disc of tergum 1 with long, erect hairs. Terga 2 to 5 with fasciae of short, nearly appressed yellowish hairs, obscuring about one-half to one-third of terga. Disc of tergum 2 with short, erect, white hairs, discs of terga 3 to 5 with short, erect, brown hairs, tergum 6 with yellow-brown, posteriorly inclined pubescence obscuring whole surface. Sternum 1 with long, erect hairs, sterna 1 to 5 with prominent, dense, subapical fimbriae of long hairs, remainder of sterna with shorter, erect hairs.

Variation. – In females the scutum varies from moderately tessellate throughout to the posterior half smooth, shiny. Females from the southern half of the range of this species have the facial foveal hairs white, while females from the northern half have the facial foveal hairs brown-white or brown. In both sexes terga 2 to 4 may have numerous brown, erect hairs, or brown hairs may be almost absent. In females the vestiture of tergum 5 varies from black to light brown-yellow, but most specimens are brown.

Type material. – The holotype female (NMNH no. 20,679) was collected by C. F. Baker in California. The allotype male (ANSP no. 4,041) was collected by H. K. Morrison in Nevada.

Parasites. – One female from East Entrance, Crater Lake Park, Klamath Co., Oregon, bears a female stylops in its abdomen.

Range and localities. – This species is found in the northwestern United States and southwestern Canada. In California it has been taken in the Sierra north of the Tehachapi Mountains with only one record from the central valley, Winters, Yolo Co. The eastern limit is western Wyoming, and in the north, southern British Columbia and Alberta. There are no records from Washington State (map 6). Altitude records range from 937 m to 3,031 m. A total of 132 females and 152 males were examined. All locality records are listed below.

ALBERTA. Banff.

BRITISH COLUMBIA. Bear Lake, Mt. Revelstoke.

CALIFORNIA. *Alpine Co.:* Ebbets Pass, Highland Lake, Woodfords, Woods Lake. *Amador Co.:*

Silver Lake. *El Dorado Co.:* Echo Lake, Echo Summit, Lake Tahoe, Strawberry Valley. *Fresno Co.:* Cherry Gap Summit (2 km S. Highway 180), Huntington Lake, Kaiser Pass, Kings River Canyon (Copper Creek), Mono Hot Springs, near Nellie Lake. *Madera Co.:* Jackass Meadow. *Modoc Co.:* Patterson Meadow (16 km S.W. Eagleville). *Mono Co.:* 3 km S. Bridgeport, Sonora Pass. *Nevada Co.:* Boca Dam (18 km E. Truckee), near Hobart Mills, Prosser Creek (3 km S. Hobart Mills), Truckee, 3 km N. Truckee. *Placer Co.:* Brockway. *Plumas Co.:* 13 km N.W. Chester. *Shasta Co.:* 8 km S.W. Old Station, Mt. Lassen. *Sierra Co.:* Gold Lake, 8 km E. Weber Lake, Yuba Pass. *Siskiyou Co.:* Castle Lake, Macdoel, 16 km N.E. McCloud. *Tulare Co.:* Crescent Meadow, Giant Forest, Hundledary Meadow, Log Meadow, Mineral King, Sequoia National Park Hockett Meadow to Shotgun Creek. *Tuolumne Co.:* Chipmunk Flat, Leland Meadow, Sonora Pass, 9 km W. Sonora Pass, Yosemite National Park, Yosemite National Park Porcupine Flat. *Yolo Co.:* Winters.

IDAHO. Buffalo (25 km S. Highway 141). *Owyhee Co.:* 18 km S.W. Grandview.

MONTANA. *Granite Co.:* Skalkaho Pass.

NEVADA. *Douglas Co.:* Dagget Pass. *Lyon Co.:* 8 km N.E. Smith. *Ormsby Co.:* Carson City.

OREGON. *Baker Co.:* Antony, Blue Mountains, Dutch Flat Trail. *Clackamas Co.:* Mt. Hood, Mt. Hood (Cloud Camp Inn Coopers Spur). *Deschutes Co.:* Bend, La Pine, 2 km W. Sisters. *Harney Co.:* Antelope Mountain. *Jackson Co.:* Mt. Ashland. *Jefferson Co.:* Whitewater Ridge, Mt. Jefferson. *Klamath Co.:* above Algona Hill, Crater Lake National Park, Crater Lake Park East Entrance, Crater Lake Park near Headquarters, Crater Lake Park Lost Creek, Crater Lake Park 8 km out Medford Road, Crater Lake Park Pole Bridge Meadow, Crater Lake Park South Rim, Crater Lake Park Sun Creek Meadows, Crater Lake Park Vidae Ridge at road, Crater Lake Park Whitehouse Camp. *Lane Co.:* 3 km E. Salt Creek Falls. *Linn Co.:* Iron Mountain, 9 km E. Upper Soda.

UTAH. *Box Elder Co.:* Willard Peak. *Cache Co.:* Logan Canyon, Wellsville Mountains, Willard Basin, White Pine Lake near Logan, Willard Peak. *Weber Co.:* Willard Peak.

WYOMING. *Teton Co.:* Grand Teton National Park.

Flight records. – Thirty-three females and 40 males were collected with the following flower visitation data: 1 female, *Aster* sp., (P,N); 1 female, *A. foliaceus* (P,N); 8 females, 8 males, *Chrysothamnus* sp., (P,N); 3 females, 25 males, *C. nauseosus speciosus* (P,N); 1 female, *C. viscidiflorus typicus* (N); 3 females, 2 males, *Happlopappus bloomeri angustatus* (P,N); 1 female, *Oxypolis occidentalis* (N); 2 females, *Senecio* sp., (N); 7 females, 2 males, *Solidago* sp., (P,N); 6 females, *S. elongata* (P,N). Females are thus oligolectic on flowers of Astereae.

Andrena scutellinitens can be distinguished from other species in this group by the much more protuberant clypeus, and by the metasomal apical fasciae which are often light yellow, rather than white as in *A. robervalensis* and *A. specularia*.

Andrena (Cnemidandrena) robervalensis Mitchell

Andrena (? Cnemidandrena) robervalensis Mitchell, 1960, N.C. Agric. Exp. Stn. Tech. Bull. 141, 1:175 (female); Krombein, 1967, U.S. Dep. Agric. Agric. Monogr. 2, suppl. 2:434 (distribution, flower record).

FEMALE. *Measurements and ratios.* – N = 20; length, 8.5-11.2 mm; width, 2.6-3.6 mm; wing length, M = 3.00 ± 0.192 mm; FL/FW, M = 1.01 ± 0.131; FOVL/FOVW, M = 3.17 ± 0.158.

Integumental color. – Black except as follows: antennae with flagellar segments ventrally becoming brown apically; mandible with apical half red; tibial spurs nearly white; tarsal claws with basal half yellow, apical half red; tegula and pterostigma medium brown; wing veins yellow brown; wing membrane hyaline except for apical area moderately darkened; metasomal terga and sterna with moderately wide hyaline apical area; pygidial plate red.

Structure. – Scape longer than flagellar segments 1 to 3; pedicel and flagellar segment 1 equal to flagellar segments 2 to 4; flagellar segment 1 longer than flagellar segments 2 plus 3. Eye 4 times longer than wide with inner margin diverging slightly above except for upper end incurving. Malar space almost 10 times wider than long. Mandible in repose projecting for one-fourth its length beyond middle of labrum with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, dorsal surface wider than lateral surface. Maxillary palpus with half apical segment projecting beyond apex of galea; segmental ratio 0.7 : 1.0 : 0.8 : 0.8 : 0.7 : 0.9. Labial palp with basal segment flattened laterally, curved, apical segment attached subapically,

segmental ratio 1.2 : 0.8 : 0.6 : 0.8. Labral process flat except emarginate area slightly reflexed, twice as wide as long, median emargination depth one-fourth length of labral process. Clypeus moderately protuberant, extending below level of eyes for one-third its length, with large punctures medially separated by 2 diameters, puncture size decreasing dorsolaterally, shagreened throughout but shagreening weak medioventrally. Supraclypeal area densely shagreened with large punctures between antennal fossae. Genal area one-third wider than eye, with reticular shagreening and small punctures separated by 4 diameters throughout, except shagreening weak near eye. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, moderately tessellate, with medium-sized, deep punctures separated by 1 diameter. Supra-antennal area longitudinally rugulate. Facial fovea of equal width throughout, rounded above and below, reaching above to a line through middle of lateral ocellus, below to a line nearly half way between lower margin of antennal fossa and upper margin of clypeus.

Pronotum with humeral angle and ridge well developed, not depressed where crossed by weak pronotal suture, shagreened throughout. Remainder of mesosoma dorsally moderately tessellate. Scutum with medium-sized, scattered punctures, punctures tessellate internally. Scutellum with tessellation weak anteriorly, nearly shiny. Metanotum with large punctures, closely grouped in lateral thirds. Propodeal enclosure with broad anterior band of irregular, longitudinal rugulae and shallow, longitudinal, median depression. Dorsoposterior surfaces with medium-sized punctures separated by 2 diameters. Propodeal corbicular area with reticular shagreening and scattered punctures in anterior fourth. Mesepisternum moderately tessellate with medium-sized punctures throughout separated by 2 to 3 diameters. Metepisternum with weak, reticular shagreening, lower half nearly shiny. Mesobasitarsus widest medially, 3 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest basally, 3.5 times longer than wide, five-sixths as wide as metatibia. Metatibia widest apically, 3.3 times longer than wide. Pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-fourth of distance from apex.

Metasomal terga 1 to 5 weakly tessellate, tessellation weaker on apical depressed areas, terga 1 to 4 with small punctures on discs separated by 6 diameters except more closely spaced on posterior margin of disc. Tergum 5 with larger punctures separated by 2 to 3 diameters. Pygidial plate narrowly rounded apically, recurved, lateral edges and median area only slightly raised, basal half with small, close punctures, apical half impunctate. Sterna 1 to 6 with weak, reticular shagreening; sternum 1 with small, median, V-shaped, apical emargination, and medium-sized punctures separated by 3 diameters; sterna 2 to 6 with broad, median, basal impunctate area, remainder with small punctures separated by 2 to 3 diameters.

Vestiture. – Clypeus with sparse, brown hairs except naked along narrow, median area. Facial fovea with hairs dark brown-black. Supraclypeal area and vertex with scutum, scutellum and pronotum with intermixed white and brown hairs. Remainder of mesosomal hairs white or nearly white. Propodeal corbicular area with widely spaced hairs in anterior fourth. Legs with hairs black or nearly black except for white hairs of meta-coxa, -trochanter and -femur, and black apical femoral fringe, and tibial scopa with ventral hairs white. Trochanteral floccus imperfect. Metasomal tergum 1 with sparse, erect, long, white hairs throughout, more numerous laterally, forming a sparse, apical fascia. Terga 2 to 4 with thin, apical fasciae of short, white, nearly appressed hairs obscuring one-third of terga. Tergum 2 with posteriorly directed long hairs on median third, with short, black, erect hairs in lateral thirds. Terga 3 to 4 with short, black, erect hairs on discs. Tergum 5 with long, posteriorly directed or appressed black hairs throughout. Sternum 1 with erect, white and black hairs, sterna 2 to 5 with subapical fimbriae well developed in lateral thirds, nearly white on sternum 2, becoming more black posteriorly. Sterna 1 to 5 with sparse, apical fringes of brown-black hairs. Punctured areas of sterna 2 to 6 with black, erect hairs, short laterally.

MALE. *Measurements and ratios.* – N = 2; length, 7.6-8.2 mm; width, 2.4-2.5 mm; wing length, 2.60-2.68 mm; FL/FW, 0.94; FS1/FS2, 1.33.

Integumental color. – Black except as follows: antenna less colored ventrally beyond second flagellar segment; mandible with apical third red; tibial spurs nearly white; distitarsi red-brown; tarsal claws with basal half yellow, apical half red; tegula, wing veins and pterostigma dark brown; wing membrane hyaline except for broad, apical area moderately darkened. Metasomal terga and sterna with moderately wide apical margin hyaline.

Structure. – Scape slightly longer than pedicel plus flagellar segments 1 plus 2, about equal to flagellar segments 1 plus 2 plus half of flagellar segment 3; flagellar segment 1 longer than flagellar

segment 3. Eye 3.3 times longer than wide, with inner margin diverging slightly above except for extreme upper limit incurved. Malar space, mandible, and galea as in female. Maxillary palpus with half of apical segment projecting beyond apex of galea; segmental ratio 0.6 : 0.9 : 0.7 : 0.8 : 0.8 : 0.8. Labial palpus with basal segment flattened, curved laterally, apical segment attached subapically, segmental ratio 1.1 : 0.5 : 0.5 : 0.7. Labral process strongly recurved, twice as wide as long, apical emargination depth one-third length of reflexed area. Clypeus nearly flat, extending below eyes for less than one-half its length, with small, medioventral, depressed, impunctate area; remainder with large punctures separated by one-half diameter, very narrow upper peripheral area with very light shagreening, surface shiny. Supraclypeal area as in female. Genal area more than 1.5 times wider than eye, produced posteriorly opposite midpoint of eye to a blunt projection, sculptured as in female. Vertex above lateral ocellus 1.3 times diameter of ocellus, sculptured as in female. Supra-antennal area as in female. Paraocular area above base of antenna sculptured as for supra-antennal area, below antenna punctured as for clypeus.

Pronotum with humeral angle and ridge well developed, almost carinate, pronotal suture very weak, humeral ridge not depressed where reached by pronotal suture, area above pronotal suture with weak, vertical rugulae, remainder of pronotum with reticular shagreening, reticular shagreening weak below pronotal suture, this area shiny. Remainder of mesosoma sculptured as in female except lateral propodeal area weakly tessellate.

Metasomal terga 1 to 5 sculptured as in female metasomal terga 1 to 4 except tessellation very weak, surface shinier. Sterna much as in female, shinier. Sternum 7 (fig. 53) with basal apodemes narrowing anteriorly; with a broad, V-shaped emargination apically, processes on each side of emargination pointed with long hairs. Sternum 8 (fig. 54) with apex and neck region almost twice as long as basal region, apex pointed; neck area with abundant, long hair. Gonoforceps (figs. 50 to 52) in dorsal and lateral view strongly ridged. Penis valves in dorsal and ventral view strongly expanded basally, narrowing gradually apically, except apex rounded, lobelike; in lateral view strongly bent downwards below gonoforceps.

Vestiture. – White except as below: clypeus with long, abundant pubescence. Terga 1 to 5 with weakly formed, apical fasciae, width one-third width of terga. Tergum 1 with long, erect hairs on disc, tergum 2 with shorter hairs on disc, some of these hairs black-brown. Terga 2 to 5 with shorter, sparse, black hairs on discs, posteriorly directed. Sterna 2 to 6 with long hairs projecting posteriorly.

Variation. – In females the proportion of white to black or nearly black hairs may vary. In most females the two long tufts of hairs projecting from the clypeus are brown. The hairs lying laterally over the facial foveae are mostly black or nearly black. The scutum may have mostly white or mostly black hairs. The small impunctate area may be nearly absent. The holotype female has only 2 submarginal cells in each wing, and metasomal tergum 1 is without a fascia, but this lack of a fascia is probably a result of wear.

Type material. – Holotype: Female, Roberval, Quebec, August, 1910 (URI). Paratypes: *Quebec:* 2 females, topotypical. *Michigan:* 1 female, Isabella Co., September 9, 1950 (R. R. Dreisbach). *Minnesota:* 1 female, Itasca Park, August 26, 1913; 1 female, Crookston, July 24, 1951 (Roland L. Fischer, on *Melilotus alba*). Paratypes are in the University of Michigan, the University of Minnesota, the collection of R. R. Dreisbach and the collection of T. B. Mitchell.

The neallotype male (here designated) (AMNH) was collected at Lewisboro, Westchester Co., New York, by M. and T. M. Favreau on September 28, 1965.

Parasites. – None.

Range and localities. – *A. robervalensis* has been taken from New York and Quebec in the east, west to Alberta and south to Wyoming (map 7). Specimens have been collected from May 5 to October 16 with most specimens taken in August and September. The earliest date after May 5 is July 15, with three other dates in late July. In all, 35 females and 2 males were examined. All collection localities including published records are given below.

ALBERTA. Cypress Hills.
COLORADO. *Larimer Co.:* Pingree Park.
MANITOBA. 5 km E. Portage la Prairie, Strathclair.
MICHIGAN. *Isabella Co.*
MINNESOTA. *Itasca Co.:* Itasca Park. *Polk Co.:* Crookston. *Roseau Co.*
NEW YORK. *Nassau Co.:* Sea Cliff. *Westchester Co.:* Lewisboro.

NORTH DAKOTA. *Benson Co.:* Tokio. *Morton Co.:* Mandan.
QUEBEC. Roberval.
SASKATCHEWAN. Regina, Rockglen.
SOUTH DAKOTA. *Custer Co.:* Custer. *Codington Co.:* Kampeska.
WISCONSIN. *Dane Co.:* Madison.
WYOMING. *Albany Co.:* Tie Siding.

Flight records. – The earliest collection date for females is for one specimen on May 5, but the next is July 15, with the last female specimen taken on October 16. The two males were taken on September 27 and 28. The earlier date of May 5 would thus seem to be erroneous.

Floral records. – Flower records are too meager to reveal flower preferences. Flower records for 5 females are as follows: 1 female, *Brassica campestris* (N); 2 females, *Medicago sativa* (N); 1 female, *Melilotus alba* (N); 1 female, *Sonchus varensis* (P,N).

Within the Scutellinitens group, *A. robervalensis* may be distinguished from *A. scutellinitens* by the clypeus less protuberant, and from *A. specularia* by the scutellum tessellate and dull. *A. robervalensis* has much more black hair than the other two species and the wings are more clouded apically. In size, disposition, and coloration of vestiture, *A. robervalensis* is much like *A. peckhami,* but is widely separated from that species by the inner margin of the compound eye diverging slightly above except for upper end incurved, and the males without a strong genal ridge.

Andrena (Cnemidandrena) specularia Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 15; length, 8.5-9.6 mm; width, 2.9-3.4 mm; wing length, M = 2.90 ± 0.119 mm; FL/FW, M = 0.97 ± 0.083; FOVL/FOVW, M = 3.34 ± 0.204.

Integumental color. – Black except as follows: antenna light brown ventrally beyond second flagellar segment; mandible with apical half red; tibial spurs light yellow-white; mediotarsi, distitarsi, and basal half of tarsal claws yellow, tarsal claws with apical half red; tegula shining light brown, wing veins medium brown, pterostigma with median area yellow; wing membrane moderately darkened apically; metasomal terga and sterna with moderately wide, apical marginal area hyaline; pygidial plate black apically and laterally, dark red medially.

Suture. – Scape equal in length to flagellar segments 1 to 3 plus half of flagellar segment 4; flagellar segment 1 equal to flagellar segments 2 plus 3; flagellar segment 2 slightly shorter than flagellar segment 3. Eye slightly less than 4 times longer than wide, with inner margin diverging slightly above except for upper end incurved. Malar space 7 times wider than long. Mandible in repose extends for one-fourth its length or less beyond middle of labrum, with notch of mandible tooth one-third distance between middle of labrum and mandible apex from middle of labrum. Galea moderately tessellate, dorsal surface 1.5 times wider than lateral surface. Maxillary palpus with half apical segment projecting beyond apex of galea; segmental ratio 0.7 : 0.8 : 0.6 : 0.6 : 0.6 : 0.6. Labial palpus with basal segment compressed and curved laterally, ultimate and penultimate segments attached subapically, segmental ratio 1.0 : 0.6 : 0.5 : 0.6. Labral process with apex slightly recurved, 2.3 times wider than long; median emargination depth one-fourth length of labral process. Clypeus weakly protuberant, extending below eyes for less than half its length; lower median area slightly "dented", with large punctures separated by 1 diameter or more medially, punctures slightly smaller and closer above and laterally, whole area shagreened, shagreening becoming lighter in lower median area. Supraclypeal area with very small punctures almost obscured by moderate shagreening. Genal area less than twice as wide as eye, third nearest eye with very small punctures separated by 2 or more diameters and lightly shagreened; remainder with larger punctures separated by 4 or more diameters, with moderate shagreening. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, with medium-sized, deep punctures separated by 1 diameter, moderately tessellate. Supra-antennal area with longitudinal rugulae and small, indistinct, interrugal punctures, Facial fovea 3 times longer than wide, narrowing very slightly below, rounded above and below, reaching above to a line just above median ocellus, below to a line nearly equidistant between facial fovea and base of clypeus.

Pronotum with humeral angle and ridge well developed, humeral ridge narrowly depressed where crossed by deep pronotal suture; with scattered, medium-sized punctures dorsally, area above pro-

notal suture with weak, vertical rugulae, angle between lateral surface and pronotal lobe very deep, polished, dorsal area shagreened, lateral area weakly tessellate except as described. Scutum with widely spaced punctures of irregular size, moderately tessellate. Scutellum with widely spaced punctures of irregular size, moderately tessellate. Scutellum with anterior two-thirds with only 1 or 2 punctures, polished, mirror-like; remainder with medium-sized, widely spaced punctures, moderately tessellate. Metanotum sculptured as for posterior third of scutellum except punctures closer, and appearance more roughened. Propodeal enclosure anteriorly with narrow band of short, longitudinal rugulae, remainder moderately tessellate; dorsoposterior surface with medium-sized punctures separated by 3 diameters except closer on lateral edges, corbicular area with medium-sized, widely spaced punctures in anterodorsal third or less, with reticular shagreening throughout. Mesepisternum with large, deep punctures irregularly spaced, moderately tessellate. Metepisternum with very small punctures above, finely lined throughout. Mesobasitarsus widest medially, slightly more than 2.5 times longer than wide, equal in width to metabasitarsus. Metabasitarsis widest medially in basal third, more than 3 times longer than wide, about five-sixths as wide as metatibia. Metatibia moderately cuneate, slightly curved, widest apically, 3.5 times longer than wide. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-fourth of distance from apex.

Metasomal terga 1 to 4 with medium-sized to small punctures on apical margin of disc, separated on terga 2 to 4 by 2 diameters except more widely spaced on tergum 1; discs of terga 1 to 4 with widely scattered punctures except punctures more dense laterally on terga 1 and 2; discs of terga 1 to 4 with moderate to weak tessellation, depressed, apical, hyaline areas shagreened. Tergum 5 with large punctures on disc separated by 1.5 diameters, punctures on depressed area smaller, closer, with weak tessellation throughout. Pygidial plate narrowly truncate apically, edges and broad, median area raised, with small, contiguous punctures throughout. Sternum 1 with small, shallow, apical emargination, with medium-sized punctures separated by 2 diameters; sterna 2 to 6 with smaller punctures separated by 2 diameters, except median, basal areas impunctate, sterna weakly shagreened.

Vestiture. – Clypeus with vestiture white, sparse medially. Facial fovea with vestiture seal brown. Scutum, scutellum with most vestiture white, some dorsal hairs light brown or brown. Propodeal corbicula with scattered, plumose hairs in anterodorsal third. Trochanteral floccus imperfect. Metafemur with apical fringe seal brown. Tibiae and tarsi with hairs seal brown except ventral, metatibial, scopal hairs white. Remaining tarsal segments with most hairs white but some seal brown.

Metasomal tergum 1 with long, erect, white hairs apically and laterally on disc, apical hairs not forming a distinct fascia, not obscuring surface. Terga 2 to 4 with apical fasciae of white, recumbent hairs obscuring about one-third of terga. Tergum 2 with a very few, medium length, erect hairs in narrow, median area, shorter, erect hairs transversely just anterior to apical fascia, and laterally on disc, some of the lateral hairs slightly discolored, remaining area naked. Terga 3 and 4 with short, erect hairs laterally on discs, the shortest hairs brown to black, remainder white. Tergum 5 with long hairs throughout, anterior hairs nearly erect, becoming recumbent apically, surface of tergum not obscured basally, hairs seal brown except some anterior, lateral hairs white. Sterna 1 and 2 with long, erect, white hairs medially, sterna 2 to 5 with subapical fimbriae well developed in lateral thirds, white in sterna 2 to 4, seal brown on sternum 5. Sterna 2 to 4 with apical fringes in lateral thirds of white, appressed hairs. Remaining punctured area of sterna 3 to 6 with short, erect, brown to black hairs.

Variation. – The facial foveae vary somewhat in width in upper half, some being noticeably wider than lower half. Brown-black hairs vary in relative abundance.

Type material. – The holotype female (NDSU no. 701) and 16 female paratypes (3 UCD, 13 NDSM) were collected by P. W. Fattig at Mandan, Morton Co., North Dakota, on September 5, 1917. One paratype female (NDSM) has the abdomen missing.

Parasites. – One female from Mandan, Morton Co., North Dakota, is carrying one female stylops in its abdomen.

Range and localities. – This species is known only from 17 females, all from Mandan, Morton Co., North Dakota (map 6).

Flight records. – All females were taken on September 5.

Floral records. – None.

The females can be distinguished from the females of the two other species of the Scutellinitens group, *A. scutellinitens* and *A. robervalensis*, by the extremely shiny, mirror-like scutellum.

Andrena (Cnemidandrena) nubecula Smith

Andrena nubecula Smith, 1853, Cat. Hymenop. Brit. Mus. 1:117 (female); Robertson, 1891, Trans. Am. Entomol. Soc. 18(7) 50, 59 (key, record); Robertson, 1897, Trans. St. Louis Acad. Sci. 7(14) 330 (description, record); Morice and Cockerell, 1901, Can. Entomol. 33:150 (type, record); Robertson, 1902, Trans. Am. Entomol. Soc. 28:191, 192 (key); Cockerell, 1906, Psyche 13:8 (type); Viereck, 1907, Entomol. News 18:282, 285, 287 (key); Cockerell, 1931, Am. Mus. Novit. 458:13 (key, record).

Andrena nubecula tristicornis Cockerell, 1931, Can. Entomol. 63:22 (female).

Andrena nubicula, Buckell, 1949, Proc. Entomol. Soc. B. C. 45:28 (misspelling for *nubecula;* record).

Andrena (Cnemidandrena) nubecula, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Mitchell, 1960, N.C. Agric. Exp. Stn. Tech. Bull. 141; 1:174-175 (description, distribution); Linsley, in Muesebeck et al., 1951. U.S. Dep. Agric. Agric. Monogr. 2:1074; Krombein, 1967, U.S. Dep. Agric. Agric. Monogr. 2, suppl. 2:432 (distribution, flower records).

FEMALE. *Measurements and ratios.* – N = 20; length, 6.6-8.5 mm; width, 2.5-1.9 mm; wing length, M = 1.03 ± 0.076 mm; FL/FW, M = 1.03 ± 0.092; FOVL/FOVW, M = 3.73 ± 0.302.

Integumental color. – Black except as follows: antenna becoming yellow-brown apically beyond second flagellar segment; mandible with apical half red; tibial spurs white, tinged lightly with yellow; distitarsi and basal half of tarsal claws brown-yellow, apical half of tarsal claws red; tegula and wing veins brown-yellow, pterostigma dark brown to black; wing membrane strongly darkened in marginal cell and apically, remainder slightly darkened to hyaline. Metasomal terga and sterna widely hyaline apically; pygidial plate with basal half yellow, apical half dark red.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 almost as long as flagellar segment 2 plus 3; flagellar segment 2 equal to flagellar segment 3. Eye slightly more than 3.5 times longer than wide with inner margin diverging above except for upper end inwardly curved. Malar space more than 8 times wider than long. Mandible in repose extends for more than one-fourth its length beyond middle of labrum, with notch of mandible tooth slightly less than one-half distance between middle of labrum and mandible apex. Galea moderately tessellate, dorsal surface equal in width to lateral surface. Maxillary palpus with half of apical segment projecting beyond apex of galea; segmental ratio 0.6 : 0.9 : 0.6 : 0.6 : 0.5 : 0.6. Labial palpal basal segment flattened and curved laterally, apical segment attached somewhat subapically, segmental ratio 1.0 : 0.5 : 0.5 : 0.5. Labral process nearly flat except area near base of median, apical emargination raised; labral process length two-thirds width, median emargination depth one-fifth length of labral process. Clypeus not protuberant, nearly flat, extending below eyes for one-half its length; with strong, reticular shagreening throughout, surface dull, with large punctures separated by less than 1 diameter, except for narrow, longitudinal, impunctate strip. Supraclypeal area with small, indistinct punctures obscured by dense shagreening. Genal area 1.3 times wider than eye, shagreened throughout but shagreening weak near eye; whole area with small punctures, separated by 1 to 2 diameters near eye, but more widely separated posteriorly. Vertex above lateral ocellus slightly wider than 1 ocellar diameter; with weak, irregular tessellation and medium-sized, deep punctures on apex separated by 1 to 2 diameters. Supraantennal area with longitudinal rugulae with weak tessellation in interrugal spaces. Facial fovea narrow, of nearly equal width throughout, 3.75 times longer than wide, rounded above and below, reaching above to a line through middle of median ocellus, reaching below to a line below antennal fossa.

Pronotum with humeral angle and ridge well developed, except humeral ridge somewhat depressed where crossed by weak, pronotal suture, pronotum dorsally with reticular shagreening, laterally sculpturing becoming weakly tessellate. Remainder of mesosoma dorsally with moderate tesselation except as follows: scutum, scutellum, and metanotum with medium-sized punctures separated by 4 diameters or more; scutellum with tessellation weak anteriorly, nearly shiny; propodeal enclosure with narrow, anterior fringe of irregular rugulae, medially with shallow, longitudinal depression; dorsoposterior areas of propodeum with medium-sized punctures separated widely near propodeal enclosure, closely grouped laterally. Propodeal corbicular areas with reticular shagreening and scattered, medium-sized punctures in anterodorsal third. Mesepisternum moderately shagreened with medium-sized punctures separated by 2 to 3 diameters. Metepisternum lightly shagreened, nearly shiny. Mesobasitarsus widest medially, slightly less than 3 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest in mid-point of basal third, slightly less than 4 times longer than wide, one-seventh narrower than metatibia. Metatibia 3.5 times longer than wide. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-fifth distance from apex.

Metasomal terga 1 to 5 with weak tessellation; tergum 1 impunctate on disc and on apical margin of disc but with some punctures laterally; terga 2 to 4 with apical margins of discs with small punctures separated by less than 1 diameter, tergum 4 with small, scattered punctures on disc, tergum 5 with large punctures separated by 2 diameters. Pygidial plate narrowly rounded apically, with edges and median area raised, with small, crowded punctures except for small, impunctate, apical area. Sterna 1 to 6 with reticular shagreening; sternum 1 with shallow, median, V-shaped emargination; sterna 1 and 2 with medium-sized punctures throughout, separated by 3 diameters; sterna 3 to 6 with similar sized punctures except broad, basal areas impunctate.

Vestiture. – White except as below: clypeus thinly covered, scutum, scutellum, and metanotum with very few, sparse, erect hairs. Propodeal corbicula with sparse hairs in anterior third; trochanteral floccus imperfect; scopa with dorsal, basal hairs tinged with black. Metasomal tergum 1 completely naked except for short hairs laterally and on extreme anterior of disc; terga 2 to 4 with a narrow, compact, apical fasciae of short, appressed, white-yellow hairs; fasciae obscuring one-fifth or slightly more of terga. Tergum 5 nearly obscured by recumbent, nearly white hairs. Sternum 1 with erect hairs throughout, sterna 1 to 5 with apical fringes in lateral thirds, subapical fimbriae present in lateral thirds, erect hairs on punctured areas.

MALE. *Measurements and ratios.* – N = 20; length, 5.6-7.5 mm; width, 1.4-1.9 mm; wing length, M = 1.90 ± 0.130 mm; FL/FW, M = 0.95 ± 0.093; FS1/FS2, M = 1.37 ± 0.118.

Integumental color. – Black except as follows: antenna yellow-brown ventrally beyond first flagellar segment; mandible with slightly less than apical half red; mesosoma as in female except mediotarsi, distitarsi and basal half of tarsal claws yellow; metasomal terga with almost whole of depressed, apical area hyaline; sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 2 plus 3 plus half of flagellar segment 4; flagellar segment 1 equal to 1.3 times length of flagellar segment 2; flagellar segment 2 shorter than flagellar segment 3. Eye 3.5 times longer than wide with inner margin diverging above except for upper end inwardly curved. Malar space as in female. Mandible extending for more than one-fourth its length beyond middle of labrum; notch of mandible tooth one-fifth of distance between middle of labrum and mandible apex from middle of labrum. Galea as in female. Maxillary palpus with apical segment projecting beyond apex of galea; segmental ratio 0.7 : 0.7 : 0.5 : 0.6 : 0.6 : 0.6. Labial palpus as in female except segmental ratio 0.8 : 0.5 : 0.5 : 0.6. Labral process strongly reflexed, twice as wide as long, depth of median emargination one-third length of labral process. Clypeus nearly flat, extending for slightly less than one-half its length below level of eyes, with large punctures throughout separated by less than one-half diameter on dorsolateral periphery, but by 3 to 4 or more diameters mediodorsolateral periphery weakly shagreened, remainder shiny. Supraclypeal area as in female. Genal area slightly more than twice as wide as eye, produced posteriorly opposite midpoint of eye to a blunt projection; posterior margin above blunt projection weakly angulate; sculpturing as in female. Vertex and supra-antennal area as in female; paraocular areas sculptured as for supra-antennal area.

Pronotum with humeral angle and ridge very well developed, humeral ridge almost carinate above; pronotal suture represented by shallow depression not reaching humeral angle, area above pronotal suture dorsoventrally rugulate; angle below between pronotal lobe and humeral angle smooth, polished, remainder of pronotum shagreened, dorsally with medium-sized, indistinct punctures separated by 1 diameter. Scutum with large punctures separated by 1 to 2 diameters, anterior half shagreened, remainder shiny. Scutellum with similar punctation except punctures sparse on anterior two-thirds, posterior third shagreened, anterior two-thirds shiny. Remainder of mesosoma as in female except propodeal corbicular areas with reticular shagreening.

Metasomal tergum 1 posteriorly and laterally with medium-sized punctures separated by 3 diameters, disc impunctate medially; terga 2 to 4 with small punctures on disc, separated by 3 to 4 diameters, more closely spaced on apex of disc; tergum 5 with larger punctures on disc separated by 3 diameters; terga 1 to 5 weakly shagreened, dull. Sterna 1 to 6 much as in female. Sternum 7 (fig. 58) with apex broadly and shallowly emarginate with nearly whole of apical edge with hairs; basal apodemes bluntly rounded basally. Sternum 8 (fig. 59) with apex and neck region longer than basal region, apex broadly expanded, neck with sides concave and with abundant, long hairs. Gonoforceps (figs. 55 to 57) in dorsal view with inner apical edge very shallowly emarginate; with a strong, oblique ridge reaching outer edge. Penis valves in dorsal and ventral view narrow, weakly expanded basally, apex lobelike; in lateral view downturned, shorter than gonoforceps.

Vestiture. – White except for tergal vestiture tinged with yellow. Clypeus with dense, white pubescence. Scutum, scutellum and metanotum with pubescence erect, long, hairs widely spaced, not obscuring surface. Metasomal tergum 1 with apical margin and lateral areas of disc with short, semi-erect, sparse hairs, median area of disc naked; terga 2 to 4 with apical fasciae of short, appressed hairs not obscuring surface of terga, fasciae extending over one-fourth or less of terga; terga 2 to 5 with very short, fine, sparse, erect hairs on discs. Tergum 5 with apical margin of disc with widely spaced, long, semi-erect hairs not obscuring surface. Sternum 1 with long, erect hairs throughout. Sterna 1 to 5 with subapical fimbriae of long, erect hairs, that on sternum 1 moderately dense, on sterna 2 to 5 very dense; discs of sterna 2 to 6 with long, sparse, erect hairs.

Variation. – Specimens from the eastern United States (New York) have the wings very strongly darkened to almost black apically. Specimens from the northwest (Oregon and Washington) and from the southwest (Arizona and New Mexico) have the wings much lighter apically. The eastern female specimens have the tergal apical fasciae light yellow, tergum 5 with the vestiture distinctly light brown, and the scopa darkened throughout. In a small number of female specimens from throughout the range of the species the facial foveae are somewhat wider above than below. Of five females from Glen Echo, Montgomery Co., Maryland, one has a small patch of hairs apically near the median line on tergum 1. Of three females from West Point, Cuming Co., Nebraska, one has a poorly formed apical fascia on tergum 1, and another female has a few scattered hairs apically on tergum 1.

Type material. – Smith (1853) apparently based his description of *A. nubecula* on females collected by E. Doubleday, Esq., in the United States, and Lieutenant Redman in Nova Scotia (no dates given). Four females which appear to belong to this series are held in the BMNH. One was collected by Lieutenant Redman in Nova Scotia, and three in the United States. The female collected by Lieutenant Redman in Nova Scotia is here designated as lectotype.

The holotype female of *A. nubecula tristicornis* (PHT) was taken at Lakeside, Quebec, by J. W. Buckle on August 20, 1929. One paratype female (PHT) was taken at Milwaukee, Wisconsin, by Graenicker on July 26, 1902.

Parasites. – One female from Rifle, Garfield Co., Colorado, and one female from Blood Mountain, Union Co., Georgia, show evidence of having each carried a male stylops in their abdomens. One female from Urbana Brownfield Woods, Champaign Co., Illinois, carries a triungulin on its left compound eye. One female from Grand Forks, Grand Forks Co., North Dakota, and another from Valley City, Barnes Co., North Dakota, are each carrying one female stylops in their abdomens.

Range and localities. – *A. nubecula* is the most widely distributed North American species of *Cnemidandrena.* It is the only species found from the Atlantic Coast to the Pacific Coast, and it reaches further south in the eastern United States (northern Georgia) than any other species (map 8). All together, 634 females and 332 males were examined. Altitude records range from 1,000 m to 2,987 m.

ARIZONA. *Coconino Co.:* Flagstaff, Houserock Valley, Humphrey's Peak at base, Oak Creek Canyon.

BRITISH COLUMBIA. Vernon.

COLORADO. *Arapahoe Co.:* Denver. *Boulder Co.:* Boulder, Jim Creek near Boulder. *Eagle Co.:* Gypsum. *Fremont Co.:* Coaldale. *Garfield Co.:* Rifle. *Larimer Co.:* 3 km N. Laporte, Pingree Park. *Park Co.:* Deer Creek Canyon. *Weld Co.:* Greeley. *Yuma Co.:* Wray.

CONNECTICUT. *Fairfield Co.:* New Canaan, Stamford, *Litchfield Co.:* Colebrook, Woodbury. *New Haven Co.:* New Haven West Rock Park. *Tolland Co.:* Stafford.

GEORGIA. *Union Co.:* Blood Mountain, Levelland Mountain.

IDAHO. *Bannock Co.:* Downey. *Blaine Co.:* Carey. *Latah Co.:* Moscow.

ILLINOIS. *Alexander Co.:* Olive Branch. *Carroll Co.:* Savanna. *Champaign Co.:* Urbana Brownfield Woods. *Clark Co.:* Marshall. *Cook Co.:* Palos. *Iroquois Co.:* Conservation Area. *Jackson Co.:* Carbondale. *Jo Daviess Co.:* Apple River Cyn. S.P. *Kankakee Co.:* 8 km E. Kankakee. *Macoupin Co.:* Carlinville. *McDonough Co.:* Macomb. *Piatt Co.:* White Heath. *Union Co.:* Pine Hills. *White Co.:* 3 km S. Norris City.

INDIANA.

IOWA. *Allamakee Co.:* Harpers Ferry. *Polk Co.:* Des Moines. *Story Co.:* Ames. *Woodbury Co.:* Sioux City.

MAINE. Indiantown, Mount Desert Island. *Cumberland Co.:* Bridgeton. *Lincoln Co.:* Waldoboro. *Somerset Co.:* Ogontz. *York Co.:* Kezar, Saco.

MANITOBA. Brandon.

MARYLAND. Great Falls. *Montgomery Co.:* Bethesda, Glen Echo, Plummers Is. *Prince Georges Co.:* Beltsville, Bladensburg.

MASSACHUSETTS. Campbell Falls. *Middlesex Co.:* Arlington. *Norfolk Co.:* Brookline, Framingham. *Suffolk Co.:* Forest Hills. *Worcester Co.:* Holden.

MEXICO. NUEVO LEON: 70 km S. Saltillo.

MINNESOTA. Haydenville, Muskoda. *Bigstone Co.: Carver Co.:* Aumbra Heights. *Chisago Co.:* Chisago City. *Dakota Co.:* Hastings. *Kandiyohi Co.:* Willmar. *Lac qui Parle Co.:* Bellingham. *Lincoln Co.:* Lake Benton, Hendricks. *Rock Co.:* Luverne. *Yellow Medicine Co.*

MONTANA. *Gallatin Co.:* Amsterdam, Belgrade, Gallatin Gateway, Three Forks. *Lewis and Clark Co.:* Helena. *Mineral Co.:* St. Regis, Superior. *Missoula Co.:* Missoula. *Yellowstone Co.:* 10 km N. Pmpeys Pillar.

NEBRASKA. *Adams Co.:* Hastings. *Buffalo Co.:* 2 km E. Ravenna. *Chase Co.:* 16 km S.W. Imperial. *Cuming Co.:* West Point. *Douglas Co.:* Omaha. *Lancaster Co.:* Lincoln. *Nemaha Co.:* Peru. *Scotts Bluff Co.:* Gering. *Sheridan Co.:* Gordon. *Sioux Co.:* Glen, Monroe Canyon. *York Co.:* McCool.

NEW BRUNSWICK. Saint Andrews.

NEW HAMPSHIRE. *Belknap Co.:* Center Harbor, Meredith. *Carroll Co.:* North Conway. *Cheshire Co.:* Nelson. *Coos Co.:* Lancaster. *Grafton Co.:* Bath, Lebanon. *Hillsborough Co.:* Pelham. *Strafford Co.:* Durham, Farmington.

NEW JERSEY. *Bergen Co.:* Fort Lee, Montvale, Palisades, Ramsey. *Camden Co.:* Clementon. *Morris Co.:* Budd Lake. *Ocean Co.:* Lakehurst. *Union Co.:* Union.

NEW MEXICO. *Colfax Co.:* Springer.

NEW YORK. *Albany Co.:* Rensselaerville. *Cattaraugus Co.:* Allegany State Park. *Cortland Co.:* The Hook McLean Reserve. *Delaware Co.; Erie Co.:* Derby Hill. *Greene Co.; Jefferson Co.:* Grindstone I. Clayton. *Nassau Co.:* Lynbrook, New York City Inwood Hill Park. *New York Co.:* Central Park New York. *Orange Co.:* Fort Montgomery, Greenwood Lake, near Tuxedo, West Point. *Suffolk Co.:* Long Island Huntington, Kalbfleisch R.S. *Tompkins Co.:* Beebe Lake, Ithaca, Ludloville. *Westchester Co.:* Bedford, Lewisboro.

NORTH CAROLINA. *Avery Co.:* Grandfather Mountain. *Buncombe Co.:* Black Mountains. *Macon Co.:* Highlands. *McDowell Co.:* Marion.

NORTH DAKOTA. *Barnes Co.:* Valley City, *Cass Co.:* Fargo. *Grand Forks Co.:* Grand Forks. *Ransome Co.:* 2 km S.E. McLeod. *Stutsman Co.:* Jamestown.

OHIO. *Franklin Co.:* Columbus. *Stark Co.*

ONTARIO. Dunnville, Effingham near Fonthill, Gravenhurst Muskoka Dist., Orilla, Ottawa, Perth Road, Saint John's West.

OREGON. *Baker Co.:* Baker, Herford, Huntington, N. Powder. *Malheur Co.:* 8 km W. Homedale, 18 km W. Ontario, Vale. *Wallowa Co.:* Wallowa.

PENNSYLVANIA. *Allegheny Co.:* Crafton, Ingram, Pittsburgh. *Cumberland Co.:* Mount Holly Springs. *Delaware Co.:* 8 km S. Bryn Mawr. *Lackawanna Co.:* Spring Brook. *Monroe Co.:* Pocono Pines. *Montgomery Co.:* Glenside.

PRINCE EDWARD ISLAND. Prince Edward Island National Park.

QUEBEC. Lakeside, Montreal.

RHODE ISLAND. *Providence Co.:* Scituate.

UTAH. Pleasant Valley. *Beaver Co.:* 11 km N. Beaver. *Box Elder Co.:* Snowville. *Cache Co.:* Newton. *Carbon Co.:* Price. *Duchesne Co.:* Duchesne, Myton, Roosevelt. *Kane Co.:* Bryce Canyon. *Uintah Co.:* Naples, Vernal. *Utah Co.:* 16 km W. Mollies Nipple. *Weber Co.:* Huntsville.

VERMONT. *Caledonia Co.:* W. Danville.

VIRGINIA. *Arlington Co.:* Kearney. *Fairfax Co.:* Arlington, Falls Church, Great Falls, Rosslyn, 5 km W. Vienna. *Giles Co.:* Mountain Lake. *Page Co.:* Shenandoah National Park. *Stafford Co.:* Stafford.

WASHINGTON. *Pend Oreille Co.:* Metaline Falls. *Whitman Co.:* Pullman. *Yakima Co.:* Mount Adams, Yakima.

WEST VIRGINIA. *Fayette Co.:* Babcock State Park.

WISCONSIN. *Dane Co.:* Madison. *Milwaukee Co.:* Milwaukee. *Richland Co.:* 8 km S. Lone Rock.

WYOMING. *Converse Co.:* 16 km S.W. Douglas. *Fremont Co.:* Baldwin Creek, 5 km N.W. Lander.

Flight records. – Females have been taken from July 13 to October 23, and males have been taken from July 18 to September 29. Most specimens were taken in August and September.

Floral records. – Females collect pollen from species within Astereae, particularly from species of *Solidago.* Flower records for 140 females and 35 males are as follows: 6 females, *Aster* sp., (P,N); 1 female, *A. ericoides* (N); 1 female, *A. multiflorus* (N); 1 female, *A. umbellatus* (P,N); 1 female, *Chrysothamnus* sp., (N); 1 female, *C. nauseosus* (N); 1 female, *Cleome* sp., (N); 1 female, *Encelia farinosa* (N); 1 male, *Euthamia graminifolia;* 1 female, *Grindelia* sp., (P,N); 106 females, 27 males, *Solidago* sp., (P,N); 7 females, *S. altissima* (P,N); 7 females, 5 males, *S. canadensis* (P,N); 1 female, *S. junua* (P,N); 2 females, 1 male, *S. nemoralis* (P,N); 1 female, *S. puberula* (P,N); 2 females, *S. rigida* (P,N); 1 male, *Trifolium procumbens.*

A. nubecula is distinguished by the absence of apical hair on metasomal tergum 1 with the wings strongly darkened apically and in the marginal cell; and the males with the posterior margin of the gena rounded or with a weak spine. Its closest relative, although somewhat separated from it, is *A. xanthigera,* which, although having the wing darkened apically with some darkening in the marginal cell, does have a subapical fascia on tergum 1. *A. candensis* and *A. bocensis* also are naked apically on tergum 1. *A. canadensis* and *A. bocensis* also are naked apically on tergum 1, but the wings are hyaline and the integument is generally shiny, not dull as in *A. nubecula* and *A. xanthigera,* thus the relationship must be less than that between *A. nubecula* and *A. xanthigera.*

Andrena (Cnemidandrena) xanthigera Cockerell

Andrena xanthigera Cockerell, 1900, Ann. Mag. Nat. Hist. (7)5:402-403, (female); 1902, Can. Entomol. 34:47 (group); 1931, Can. Entomol. 63:22 (synonymy); 1931, Am. Mus. Novit. 458:19 (synonymy).

Andrena (Cnemidandrena) xanthigera, Lanham, 1949. Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951. U.S. Dep. Agric. Agric. Monogr. 2:1086.

Andrena albovirgata Cockerell, 1900. Ann. Mag. Nat. Hist. (7)5:402-403, (female); Viereck, 1903. Trans. Am. Entomol. Soc. 29:54 (group); Cockerell, 1931. Can Entomol. 63:33 (synonymy); Cockerell, 1931. Am. Mus. Novit. 458:19 (synonymy).

Andrena (Cnemidandrena) albovirgata, Lanham, 1949. Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951. U.S. Dep. Agric. Agric. Monogr. 2:1086.

FEMALE. *Measurements and ratios.* – N = 13; length, 6.3-7.9 mm; width, 1.9-2.5 mm; wing length, M = 2.37 ± 0.148 mm; FL/FW, M = 1.02 ± 0.070; FOVL/FOVW, M = 3.77 ± 0.207.

Integumental color. – Black except as follows: antenna yellow-brown ventrally beyond second flagellar segment; mandible with apical half red; tibial spurs white; mediotarsi, distitarsi, basal half of tarsal claws light brown-yellow; apical half of tarsal claws red; tegula hyaline light brown; wing veins dark brown, pterostigma nearly black; wing membrane apically and in area of marginal cell moderately to strongly darkened; remainder hyaline to very lightly darkened; metasomal terga and sterna moderately widely hyaline apically; pygidial plate black apically and laterally, median area dark red.

Structure. – Scape equal to flagellar segments 1 to 3 plus half of flagellar segment 4; flagellar segment 1 equal to flagellar segments 2 plus 3; flagellar segment 2 shorter than flagellar segment 3. Eye 3.5 times longer than wide, with inner margin diverging above except for upper end incurved. Malar space 8 times wider than long. Mandible in repose with less than one-third its length projecting beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, with dorsal surface somewhat wider than lateral surface. Maxillary palpus with half of apical segment projecting beyond apex of galea; segmental ratio 0.8 : 0.8 : 0.6 : 0.7 : 0.6 : 0.7. Labial palpus with basal segment laterally compressed and curved, apical segment attached somewhat subapically, segmental ratio 0.9 : 0.6 : 0.5 : 0.6. Labral process nearly flat, trapezoid, twice as wide as long, apical emargination shallow, depth one-fifth length of labral process. Clypeus moderately protuberant, extending below eyes for less than one-half its length, with large punctures, separated widely in lower, median area leaving a small impunctate area; punctures smaller, closer near upper and outer periphery, upper third moderately shagreened, remainder shiny. Supraclypeal area with irregular punctures obscured by moderate shagreening. Genal area less than twice width of eye, with small punctures separated by 1 diameter, third nearest eye shiny, remainder moderately shagreened. Vertex above lateral ocellus equal to slightly more than 1 ocellar diameter, with weak tessellation obscuring medium-sized punctures, punctures separated by 1 diameter. Supra-antennal area with longi-

tudinal rugulae with obscure, interrugal punctures. Facial fovea deeply impressed, 4 times longer than wide, of almost equal width throughout except slightly wider above, rounded above and below, reaching above to a line slightly above median ocellus, reaching below to a line below antennal fossa.

Pronotum with humeral angle and ridge well developed, weak pronotal suture crossing humeral ridge, humeral ridge broadly and shallowly depressed medially, pronotum with obscure, medium-sized punctures dorsally, with moderate shagreening throughout. Scutum with medium-sized punctures separated by 4 diameters, anterior area moderately shagreened, shagreening decreasing dorsally, dorsal area very lightly shagreened, nearly shiny. Scutellum, metanotum as for dorsal area of scutum except shagreening light. Propodeal enclosure with anterior third with irregular, longitudinal rugulae, remainder weakly tessellate with shallow, median, longitudinal depression; dorsoposterior area with medium-sized punctures separated by 3 to 4 diameters, moderately tessellate, lateral, corbicular area with small to medium-sized punctures separated by 2 to 4 diameters in anterodorsal third or less, with light, reticular shagreening, surface shiny. Mesepisternum with medium-sized punctures separated by 3 diameters, moderately shagreened. Metepisternum very lightly shagreened, shiny. Mesobasitarsus widest medially, 3 times longer than wide, wider than metabasitarsus. Metabasitarsus widest near base, narrowing apically, a little more than 4 times longer than wide, two-thirds width of metatibia. Metatibia cuneate, curved ventrally, widest apically, 3.5 times longer than wide. Tibial spurs normal. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell at or slightly beyond middle.

Metasomal terga 1 to 4 with small punctures on apical margins of discs separated by 2 diameters; tergum 1 with small punctures laterally and anteriorly on disc; tergum 4 with sparse, widely scattered punctures on disc separated by 2 diameters; terga 1 to 5 with weak tessellation. Pygidial plate narrowly rounded apically, with lateral edges raised, middle flat, with small, close punctures throughout. Sternum 1 with shallow, median emargination, sterna 1 to 6 with punctures separated by 2 diameters except sterna 3 to 6 with broad, median, anterior, impunctate areas; punctures on sternum 1 medium-sized; punctures on sterna 2 to 6 small; punctures 1 to 6 with very light, reticular shagreening, shiny.

Vestiture. – White throughout. Clypeus with hairs very sparse, nearly naked medially. Scutum, scutellum with very sparse vestiture. Propodeal corbicula with sparse, erect, plumose hairs in anterodorsal third or slightly less. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with narrow, apical fasciae of short, appressed hairs, fascia of tergum 1 with hairs moderately dense, not obscuring surface, hairs not all appressed, fasciae of terga 2 to 4 obscuring one-third of terga or less, tergum 1 with disc with hairs laterally and anteriorly, tergum 2 with disc naked, terga 3 and 4 with very short, sparse, very fine, erect hairs on discs. Sternum 1 with apical fringe moderately well developed, sterna 2 to 5 with apical fringes weakly present laterally, absent medially; hairs of apical fringes becoming longer, more erect posteriorly; sternum 1 with long, erect hairs, sterna 2 to 5 with subapical fimbriae moderately developed laterally, poorly developed medially; remainder of sternal area with erect hairs except sterna 3 to 6 with impunctate anterior, median areas naked.

MALE. *Measurements and ratios.* – N = 16; length, 4.9-6.2 mm; width, 1.4-1.7 mm; wing length, M = 1.94 ± 0.102 mm; FL/FW, M = 0.96 ± 0.081; FS1/FS2, M = 1.20 ± 0.022.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond first flagellar segment; mandible with apical third red; tarsi red-brown, tarsal claw with basal half yellow, apical half red; tegula, wing as in female; metasomal terga with apical, depressed area hyaline, sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 and 2 plus half of flagellar segment 3; flagellar segment 1 a little longer than flagellar segment 2; flagellar segment 2 equal to flagellar segment 3. Eye 3 times longer than wide with inner margin moderately diverging above except for upper end incurved. Malar space, mandible and galea as in female. Maxillary palpus with half of apical segment or more projecting beyond apex of galea, segmental ratio 0.6 : 0.5 : 0.5 : 0.5 : 0.4 : 0.5. Labial palpus as in female except segmental ratio 0.7 : 0.4 : 0.4 : 0.3. Labral process very strongly reflexed, width twice length, apical emargination depth one-third length of reflexed area. Clypeus weakly protuberant; extending below eyes for less than one-third its length; with large punctures throughout separated by less than 1 diameter except more widely spaced in lower median area; shiny. Supraclypeal area as in female. Genal area 1.5 times wider than eye; genal area produced to a prominent spine opposite midpoint of eye; posterior margin above eye weakly carinate (fig. 6); sculpturing as in female. Vertex as in female. Supraclypeal area with frontal line strongly developed, longitudinal rugulae weakly devel-

oped medially, more strongly developed laterally, punctures obscure. Paraocular areas with medium-sized, close punctures.

Pronotum with humeral angle and ridge strongly developed, humeral ridge almost carinate, broadly and shallowly depressed medially; pronotal suture obscure; sculptured as in female except nearly shiny beneath humeral ridge. Remainder of thorax as in female except scutum, scutellum smooth, shiny dorsally.

Metasomal terga 1 to 5 with small punctures on discs, separated on apical margins of discs by 2 diameters; terga 1 and 2 with discs almost impunctate; terga 3 to 5 with punctures separated by 3 diameters, with very light shagreening, shiny. Sterna 1 to 6 as in female except impunctate areas of sterna 3 to 6 small. Sternum 7 (fig. 63) with basal apodemes narrowing and smoothly rounded basally; apex truncate, lateral shoulder areas with sparse hairs. Sternum 8 (fig. 64) with apex and neck region nearly twice length of basal region; apex expanded, neck with abundant, long hairs. Gonoforceps (figs. 60 to 62) in dorsal and ventral view rounded apically, with oblique ridge not reaching outer edge. Penis valves in dorsal and ventral view widest medially with sides smoothly rounded, apex narrowly lobelike; in lateral view downcurved, projecting well below and longer than gonoforceps.

Vestiture. – Silvery white throughout. Clypeus obscured by long, dense hairs. Scutum, scutellum nearly naked, with very sparse, long, erect hairs. Metafemur with hairs very silvery white on anterior and dorsal surface. Metasomal terga 1 to 4 with poorly formed, apical fasciae of sparse, semi-appressed hairs, fasciae present on less than one-third of tergal area, not obscuring surface; tergum 1 with hairs of fascia longer, more erect; remainder of disc of terga with short hairs laterally, disc with very fine, short, erect, sparse hairs dorsally except tergum 1 nearly naked. Sterna 2 to 5 with apical fringes very well developed, sterna 1 to 6 with remaining area with erect hairs, hairs shortest anteriorly.

Variation. – Four females from 24 km S.W. Concho, Apache Co., Arizona, are larger than average, and vein 1st m-cu meets second submarginal cell about one-third of the distance from the end of the cell. One female from Emery Co., Utah, has only two submarginal cells in the right wing, and the second submarginal cell in the left wing is only half normal width.

Type material. – The holotype females of *Andrena xanthigera* (NMNH no. 18941), and *Andrena albovirgata* (NMNH no. 4864) were taken at San Ignacio, San Miguel Co., New Mexico, by Wilmatte Porter on September 1, 1899. The neallotype male (KU) (here designated) was taken at Gypsum, Eagle Co., Colorado, by Ellen Ordway on August 28, 1959, on blue aster.

Parasites. – None.

Range and localities. – This species has been taken from Arizona, Colorado, New Mexico, and Utah (fig. 9). A total of 18 females and 13 males were examined. One altitude record is given, 1,968 m. All collection localities, including published records, are listed below.

ARIZONA. *Apache Co.:* Concho.

COLORADO. *Costilla Co.:* Fort Garland. *Eagle Co.:* Gypsum.

NEW MEXICO. *San Miguel Co.:* Rowe, San Ignacio.

UTAH. *Emery Co.*

Flight records. – Females have been taken from August 10 to September 25, and males were taken on August 28.

Floral records. – A total of 11 females and 13 males visited the following flowers: 6 females, 13 males, *Aster* sp., (P,N); 4 females, *Gutierrezia* sp., (P,N); 1 female, *G. sarothrae* (P,N). From the few records available, this species seems to be oligolectic upon species within the Astereae.

A. xanthigera can be distinguished from other species within the Nubecula group by the presence of an apical fascia on metasomal tergum 1 with the wing darkened apically and in the marginal cell. The males have the posterior margin of the gena prominently spine-like opposite the mid-point of the compound eye (fig. 6).

Andrena (Cnemidandrena) canadensis Dalla Torre

Andrena simulata Provancher, 1888, Addit. Corr. Faune Entomol. Can. Hymenop. 313. female, male (preoccupied).

Andrena canadensis Dalla Torre, 1896, Cat. Hymenop. 10:107 (new name); Cockerell, 1906, Trans. Am. Entomol. Soc. 32:296 (record); Viereck, 1907, Entomol. News 18:282, 286 female, male (key); Clements and Long, 1923, Carnegie Inst. Wash. Publ. 336:249 (ecology); Salt, 1927, J. Exp.

Zool. 48:245 (stylopization); Cockerell, 1931, Can. Entomol. 63:22-23 (relationship); Cockerell, 1931, Am. Mus. Novit. 458:20 (relationship); Atwood, 1934, Can. J. Res. 10:207, 209, female, male (key); Brittain and Newton, 1934, Can. J. Res. 10:261 (flower relationships); Cockerell, 1938, Can. Entomol. 70:6 (relationship).

Andrena (Pterandrena) persimilis Graenicher, 1904, Entomol. News 15:66 female; Cresson, 1929, Mem. Am. Entomol. Soc. 5:63 (list).

Andrena canadensis oslarella Viereck and Cockerell, 1914, Proc. U.S. Natl. Mus. 48:28 male; Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric Agric. Monogr. 2:1059.

Andrena (Cnemidandrena) canadensis, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1059; Mitchell, 1960, N.C. Agric. Exp. Stn. Tech. Bull. 141:172 (description, distribution).

FEMALE. *Measurements and ratios.* – N = 20; length, 6.8-8.3 mm; width, 2.3-2.7 mm; wing length, M = 2.34 ± 0.072 mm; FL/FW, M = 1.00 ± 0.079; FOVL/FOVW, M = 2.92 ± 0.101.

Integumental color. – Black except as follows: antenna light yellow ventrally beyond second flagellar segment; mandible with apical half red; tibial spurs nearly white, tinged lightly with yellow; apical half of tarsal claw red; tegula, wing veins brown, pterostigma dark brown except nearly hyaline medially; wing membrane with very light, apical shading, remainder hyaline; metasomal terga and sterna with apex moderately widely hyaline; pygidial plate very dark red-black.

Structure. – Scape equal to flagellar segments 1 to 3 plus nearly half of flagellar segment 4; flagellar segment 1 narrow in basal half, nearly equal to flagellar segments 2 plus 3; flagellar segment 2 very slightly shorter than flagellar segment 3. Eye 4 times longer than wide, inner margin diverging slightly above in about lower half, inner margin in about upper half broadly incurving. Malar space 7 times wider than long. Mandible in repose extends for a little more than one-fourth its length beyond middle of labrum, with notch of mandible tooth slightly less than one-half distance between middle of labrum and mandible apex from middle of labrum. Galea moderately tessellate, dorsal surface one-third wider than lateral surface. Maxillary palpus with apical segment projecting beyond apex of galea, segmental ratio 0.7 : 0.9 : 0.6 : 0.7 : 0.6 : 0.6. Labial palpus very strongly compressed laterally, moderately curved laterally, apical segment attached subapically, segmental ratio 1.2 : 0.6 : 0.5 : 0.6. Labral process trapezoid, twice as wide as long, apical emarginate area weakly reflexed, apical emargination shallow, depth one-fifth length of labral process. Clypeus weakly to moderately protuberant, extending below eyes for less than one-half its length, with large punctures separated by more than 1 diameter in small, lower, median area; punctures smaller, closer dorsally and laterally; upper half moderately shagreened, remainder shiny or nearly so. Supraclypeal area with close punctures obscured by moderate shagreening. Genal area 1.6 times as wide as eye, with small punctures separated by 2 to 3 diameters, more than posterior half shagreened, remainder shiny. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, with medium-sized, deep punctures separated by 1 diameter, moderately shagreened. Supra-antennal area with well developed, longitudinal rugulae, with close, interrugal punctures. Facial fovea widest and rounded above, narrowed, more pointed below, 3 times longer than wide, deeply impressed, reaching above to a line above median ocellus, reaching below to a line above clypeus.

Pronotum with humeral angle and ridge very well developed, humeral ridge straight, complete, pronotal suture not obvious; pronotum dorsally with small, obscure punctures separated by 2 or more diameters, whole pronotum with moderate shagreening. Scutum with medium-sized punctures separated by 3 diameters except more widely spaced dorsally; anterior moderately shagreened, dorsal area shiny. Scutellum with narrow, posterior margin with shagreening obscuring punctures, remainder nearly impunctate, shiny. Metanotum with medium-sized, close punctures on posterior margin, moderately shagreened, Propodeal enclosure with irregular rugulae in anterior half; posterior half with broad, shallow, longitudinal, median depression, moderately tessellate; dorsoposterior area with medium-sized punctures separated by 2 to 3 diameters, moderately tessellate; lateral corbicular area with median-sized to large, widely and irregularly spaced punctures in anterodorsal third, weakly tessellate, nearly shiny. Mesepisternum with medium-sized punctures separated by 2 or more diameters, with reticular shagreening. Metepisternum with very small punctures in upper half, with very light shagreening, nearly shiny. Mesobasitarsus widest medially, more than 2.5 times longer than wide, somewhat wider than metabasitarsus. Metabasitarsus widest mesad of mid-point, less than 4 times longer than wide, two-thirds width of metatibia. Metatibia widest apically, slightly curved ventrally, nearly 3 times longer than wide. Tibial spurs normal. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell slightly beyond middle.

Metasomal terga 1 to 4 with small punctures laterally on discs, tergum 1 with very few punctures apically on disc, terga 2 to 4 with punctures on apical margins of discs separated by 1 diameter, tergum 4 with scattered punctures on disc; remaining areas of terga 1 to 3 nearly impunctate, weakly tessellate. Tergum 5 with medium-sized punctures separated by 2 diameters, with weak tessellation. Pygidial plate narrowly rounded apically, broad, median and lateral areas raised, small apical area smooth, remainder with small, crowded punctures. Sternum 1 with small, median, V-shaped emargination, with small punctures separated by 3 diameters; sterna 2 to 6 with small punctures separated by 3 diameters except sterna 3 to 6 with median, basal, impunctate area. Sterna 1 to 6 weakly shagreened.

Vestiture. – White throughout. Clypeus with sparse hairs. Scutum with very few, short, erect hairs. Scutellum naked except for some hairs on posterior margin. Propodeal corbicula with sparse, long, plumose hairs in about anterodorsal third. Trochanteral floccus imperfect. Metasomal tergum 1 with disc with hairs on lateral margins, apex of disc naked; terga 2 to 4 with apical fasciae of short, appressed hairs, fasciae obscuring one-third of terga; tergum 2 with disc naked; discs of terga 3 and 4 with very fine, very sparse, short hairs. Tergum 5 with long, posteriorly directed hairs on disc but basal half of disc not obscured. Sternum 1 with sparse, erect hairs, apical fringe moderately developed, subapical fimbriae moderately developed laterally, poorly developed medially; sterna 2 to 6 with erect hairs on punctured areas, hairs shortest anteriorly.

MALE. *Measurements and ratios.* – N = 20; length, 5.8-7.0 mm; width, 1.5-2.1 mm; wing length, M = 2.04 ± 0.111 mm; FL/FW, M = 0.93 ± 0.083; FS1/FS2, M = 1.27 ± 0.139.

Integumental color. – Black except as follows: antenna red-yellow ventrally beyond first flagellar segment; mandible with more than apical third red; tegula, wing veins and pterostigma as in female; wing membrane hyaline throughout. Tibial spurs white or nearly so. Mediotarsi, basitarsi basal half of tarsal claws red-yellow; apical half of tarsal claws red. Metasomal terga and sterna widely hyaline apically.

Structure. – Scape shorter than flagellar segments 1 to 3; flagellar segment 1 longer than flagellar segments 2 or 3; flagellar segment 2 shorter than flagellar segment 3. Eye 3 times longer than wide, with inner margin diverging moderately above except for upper end incurved. Malar space 10 times wider than long. Mandible in repose extending for one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea as in female. Maxillary palpus with apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.7 : 0.5 : 0.5 : 0.5 : 0.6. Labial palpus as in female except segmental ratio 1.0 : 0.6 : 0.4 : 0.7. Labral process twice as wide as long, strongly reflexed, apical emargination depth one-third length of reflexed area. Clypeus weakly to moderately protuberant, somewhat depressed medially, extending below eyes for more than one-third its length, with large punctures, separated in lower, median area by 1 or more diameters, more closely spaced above and laterally; shiny. Supraclypeal area with close, irregular, medium-sized punctures, shiny. Genal area twice width of eye, strongly produced to a prominent angle opposite midpoint of eye, with a weak ridge running dorsally from the angle to below vertex, with medium-sized punctures separated by 1 or more diameters, more than posterior half shagreened, remainder near eye shiny. Vertex as in female except tessellation weak. Supra-antennal area with longitudinal rugulae, rugulae becoming weak, irregular near ocellus with obscure, interrugal punctures. Paraocular area with irregular, close punctures obscured by light shagreening, shiny.

Pronotum with humeral angle and ridge strongly developed, ridge straight, almost carinate, not or scarcely depressed medially, pronotal suture not visible, sculpturing as in female except broad angle between humeral ridge and pronotal lobe smooth or nearly so, shiny. Remainder of mesosoma sculptured as in female except as follows: scutum with posterior two-thirds of dorsal area shiny, lateral areas of propodeum with medium-sized punctures in upper third, separated by 2 diameters.

Metasomal terga 1 to 5 with discs with small punctures separated by 3 to 4 diameters except separated by 1 diameter on apical areas of discs of terga 2 to 4, with light, reticular shagreening, nearly shiny. Sternum 1 as in female, sterna 2 to 6 with small punctures separated by 2 diameters, with light, reticular shagreening, nearly shiny. Sternum 7 (fig. 68) with apex broadly and irregularly truncate, with hairs on truncate area; basal apodemes narrowing and rounded apically. Sternum 8 (fig. 69) with apex and neck region longer than basal region, apex broadly expanded, neck with abundant, long hairs. Gonoforceps (figs. 65 to 67) in dorsal view with inner apical edge somewhat emarginate; oblique ridge not reaching outer edge. Penis valves in dorsal and ventral view widest medially, lateral expansion rounded, narrowing to lobelike apex, in lateral view downcurved, shorter than gonoforceps.

Vestiture. – White throughout. Clypeus with abundant, long hairs. Scutum with sparse, erect hairs.

Scutellum with sparse hairs mostly from posterior margin. Metasomal tergum 1 with sparse, long, erect hairs on apical area of disc, long hairs on lateral margins of disc. Terga 2 to 4 with apical fasciae of short, sub-appressed hairs, fasciae present on one-third or slightly more of terga, not obscuring surface, terga 1 to 5 with sparse, erect hairs on discs, longest on tergum 1, shorter on more posterior terga. Sternum 1 with sparse, erect hairs, apical fringe well developed; sterna 2 to 5 with apical fringes strongly developed, remainder of sternal areas with sparse, erect hairs.

Variation. – A small number of females have a very few, sparse hairs apically on metasomal tergum 1. Eight females from West Point, Cuming Co., Nebraska, 1 female from Pleasant Lake, Benson Co., North Dakota, show this character; however the female from Pleasant Lake is stylopized, but the occurrence of 3 other females from North Dakota with this character suggests that the stylops is not necessarily responsible for the development of the hair on tergum 1. One female from Willow Creek, New Mexico, has 2 submarginal cells in the right wing.

Type material. – The holotype female of *A. simulata* (PLU no. 1115) was collected by Guignard at Ottawa, Canada. The holotype female of *A. persimilis* (ANSP no. 10276) was taken at Milwaukee, Milwaukee Co., Wisconsin, on August 24, 1903, collecting pollen on the flowers of *Solidago canadensis.* The holotype female of *A. canadensis oslarella* (NMNH no. 18141) was taken by Oslar at Denver, Arapahoe Co., Colorado.

Parasites. – One female from Whitehall, Jefferson Co., Montana, carries nine triungulins on the thorax; the abdomen is missing. One female from Pleasant Lake, Benson Co., North Dakota, has two female stylops in its abdomen. Salt (1927) had before him 20 stylopized females and 4 stylopized males, but collection data are not given.

Range and localities. – *A. canadensis* is widely distributed, ranging from the northeastern United States and southern Canada, westward in a narrow band through the Great Lakes Region to the mid west, where the range expands greatly, reaching west to Montana and Utah, north to the Northern Territory, Canada, and south to southern New Mexico (map 10). Totals of 226 females and 202 males were examined. Altitude records range from 1,250 m to over 2,813 m. All collection localities, including published records, are listed below.

ALBERTA. Athabasca River Long Rapids, Medicine Hat.

COLORADO. *Arapahoe Co.:* Denver. *Boulder.:* Jim Creek near Boulder. *Clear Creek Co.:* Idaho Springs. *El Paso Co.:* Manitou Park. *Larimer Co.:* Estes Park, Glen Haven. *Park Co.:* Deer Creek Canyon.

CONNECTICUT. *Fairfield Co.:* New Canaan. *Hartford Co.:* Hartford. *Litchfield Co.:* Colebrook. *Tolland Co.:* Stafford.

ILLINOIS. *Du Page Co.:* North Park.

IOWA. *Woodbury Co.:* Sioux City.

MAINE. *Lincoln Co.:* Waldoboro. *Oxford Co.:* Kezar, Lake Kezar. *Somerset Co.:* Skowhegen. *York Co.:* Saco, Woods Hole.

MANITOBA. Aweme.

MASSACHUSETTS. Forest Hills. *Esex Co.:* Beverly. *Middlesex Co.:* Reading Highlands, Sherborn. *Norfolk Co.:* Framingham, Needham.

MICHIGAN. *Cheboygan Co.; Dickinson Co; Mackinac Co.:* Jessel. *Marquette Co.; Midland Co.; Osceola Co.:* Sears.

MINNESOTA. Cooley, Haydenville. *Aitkin Co.:* Aitken. *Big Stone Co.:* Barry, Ortonville. *Cass Co.:* Chippewa National Forest. *Lincoln Co.:* Hendricks. *Yellow Medicine Co.*

MONTANA. *Jefferson Co.:* Whitehall.

NEBRASKA. *Cuming Co.:* West Point. *Custer Co.:* Broken Bow. *Douglas Co.:* Omaha. *Sheridan Co.:* Gordon. *Sioux Co.:* Glen, Glen Canyon, Harrison, Monroe Canyon.

NEW BRUNSWICK. Nerapis.

NEW HAMPSHIRE. *Cheshire Co.:* Nelson. *Grafton Co.:* Hanover, Lancaster, Littleton. *Hillsboro Co.:* Pelham. *Strafford Co.:* Durham.

NEW JERSEY. *Bergen Co.:* Closter, Englewood.

NEW MEXICO. Willow Creek. *Dona Ana Co.:* Oslar, Sapello Canon. *Otero Co.:* Hollywood. *San Miguel Co.:* San Ignacio, Tecolote.

NEW YORK. *Cortland Co.:* McLean Bogs. *Erie Co.:* Gowanda. *Monroe Co.:* Rochester. *Queens Co.:* Forest Hills. *Suffolk Co.:* Greenport, Montauk, Orient. *Tompkins Co.:* Ithaca.

NORTH DAKOTA. *Barnes Co.:* Valley City. *Benson Co.:* Pleasant Lake. *Burleigh Co.:* Bismarck. *Golden Valley Co.:* Beach. *Grand Forks Co.:* Grand Forks. *Ramsey Co.:* Devils Lake. *Williams Co.:* Williston.

NORTH WEST TERRITORY. Fort Smith.

NOVA SCOTIA. Ingonish, Cape Breton Island. *Kings Co.:* Kingsport, Truro.

ONTARIO. Bobcaygeon, Normandale, Ottawa, Point Dover, Spencerville.

PRINCE EDWARD ISLAND. Prince Edward Island National Park.

QUEBEC. Forestville, Fort Coulonge, Mont Joli, Montreal.

SASKATCHEWAN. Fort a la Corne, Saskatoon.

SOUTH DAKOTA. *Custer Co.:* Custer.

UTAH. *Emory Co.*

VERMONT. *Washington Co.:* East Northfield.

WISCONSIN. Cranmoor. *Bayfield Co.:* Salmo. *Iron Co.; Milwaukee Co.:* Milwaukee.

WYOMING. *Big Horn Co.:* Greybull. *Carbon Co.:* Walcott. *Park Co.:* Powell.

Flight records. – For females there is one record for May 14, but the next earliest date is August 3, which suggests that the May 14 date is erroneous. The last female taken was on October 6. Males have been taken from July 25 to September 21. The majority of specimens of both sexes were taken in August.

Floral records. – Females of *A. canadensis* collect pollen primarily from *Solidago* species. Flower records, including published records, for 76 females and 54 males are as follows: 5 males, *Anaphalis* sp.; 1 male, *A. margaritacea;* 3 females, *Aster* sp., (P,N); 2 females, *A. multiflorus* (P,N); 1 male, *Chrysothamnus* sp.; 1 female, *Cleome* sp., (N); 2 females, *Grindelia squarrosa* (P,N); 1 male, *Gutierrezia sarothrae;* 1 male, *Medicago* sp.; *Prunus demissa; Rubus deliciosus;* 61 females, 43 males, *Solidago* sp., (P,N); 7 females, 1 male, *S. canadensis* (P,N); 1 male, *S. rugosa.*

Andrena canadensis is very closely related to *A. bocensis.* Both species are without apical hair on metasomal tergum 1 and the wings of both are hyaline. *Andrena canadensis* is a little larger than *A. bocensis,* and its integument is a little less shiny. The two species are allopatric. *Andrena canadensis* is found in the eastern two-thirds of North America, and *A. bocensis* is confined to the mountainous areas of the western tier of states within the United States. *Andrena canadensis* probably once ranged throughout North America, but became divided into two reproductively isolated populations during climatic changes in the Great Basin region. *Andrena canadensis* can be distinguished from *A. bocensis* by its larger size, the integument less shiny, and the clypeus with more dense vestiture with more punctures throughout.

Andrena canadensis is related to *A. nubecula* through metasomal tergum 1 without apical vestiture, but the difference in wing coloration and integumental sculpture separates these species widely. It would seem to be more closely related to *A. grindeliae* which is larger and does have a weak, apical fascia on metasomal tergum 1, but which is similar in integumental sculpture.

Andrena (Cnemidandrena) bocensis Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 20; length, 6.2-7.3 mm; width, 1.9-2.3 mm; wing length, M = 2.02 ± 0.054 mm; FL/FW, M = 1.02 ± 0.086; FOVL/FOVW, M = 3.55 ± 0.233.

Integumental color. – Black except as follows: antenna yellow-brown beyond second flagellar segment; mandible red in more than apical half; tibial spurs white; disitarsi and basal half of tarsal claws yellow; apical half of tarsal claws red; tegula, wing veins and pterostigma light brown; wing membrane hyaline throughout except for very indefinite shading apically; metasomal terga and sterna with apical margin very narrowly hyaline; pygidial plate with apical third deep red, basal two-thirds yellow.

Structure. – Scape equal to flagellar segments 1 to 3, plus one-third of flagellar segment 4; flagellar segment 1 shorter than flagellar segments 2 plus 3. Eye 3.5 times longer than wide, with inner margin diverging above except upper end slightly incurved. Malar space 8 times wider than long. Man-

dible in repose extends for one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, lateral surface slightly narrower than dorsal surface. Maxillary palpus projecting slightly beond apex of galea, segmental ratio 0.6 : 0.7 : 0.6 : 0.5 : 0.4 : 0.5. Labial palpal basal segment compressed and curved laterally, apical segment attached subapically, segmental ratio 1.0 : 0.6 : 0.4 : 0.5. Labral process flat, twice as wide as long, median emargination broad, very shallow, depth one-tenth length of labral process. Clypeus moderately protuberant, projecting below eyes for slightly less than half its length, with large punctures separated by one-half puncture diameter except for median, longitudinal, impunctate area, narrow above, broadening below; upper margin shagreened, remaining area shiny. Supraclypeal area with small, widely spaced punctures obscured by moderate shagreening. Genal area 1.5 times wider than eye, with medium-sized punctures separated by less than 1 diameter near eye, more widely spaced toward posterior margin; third nearest eye shiny, remainder shagreened, dull. Vertex above lateral ocellus wider than 1 ocellar diameter, with deep, medium-sized punctures separated by less than 1 diameter, whole area with weak, irregular tessellation. Supra-antennal area with longitudinal rugulae with small, indistinct, interrugal punctures. Facial fovea of equal width throughout, 3.5 times longer than wide, rounded above and below, reaching above to a line above median ocellus, below to a line below antennal fossa.

Pronotum with humeral angle and ridge well developed but humeral ridge broadly depressed medially where reached by weak, pronotal suture; shagreened throughout, dorsally with widely spaced, medium-sized, obscure punctures. Scutum with medium-sized to small punctures separated by 1 to 3 diameters; anterior third shagreened, dull, posterior two-thirds polished. Scutellum sculptured as for polished area of scutum. Metanotum with weak, irregular tessellation obscuring small punctures posteriorly and laterally. Propodeal enclosure with strong, irregular, longitudinal rugulae in anterior half, remaining area with moderate tessellation; dorsoposterior areas with margins near propodeal enclosure raised, with moderate tessellation and medium-sized punctures separated by 2 diameters; corbicular area with reticular shagreening, shiny, with widely spaced, sparse punctures in anterodorsal third. Mesepisternum with coarse, reticular shagreening dulling surface and medium-sized punctures separated by 2 to 3 diameters. Metepisternum with weak, reticular shagreening, and sparse, very small punctures dorsally, surface shiny. Mesobasitarsus broadly expanded medially, slightly less than 3 times longer than wide, slightly wider than metabasitarsus. Metabasitarsus widest basally, slightly more than 3.5 times longer than wide, width more than two-thirds width of metatibia. Metatibia widest apically, 4 times longer than wide. Wing with pterostigma slightly more than 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-fifth of distance from apex.

Metasomal terga 1 to 5 with reticular shagreening except for apical, hyaline area smooth; disc and apical area of disc of tergum 1 impunctate; apical areas of discs of terga 2 to 4 with small punctures separated by 1 diameter, discs of terga 2 to 4 with very small, indistinct, scattered punctures; lateral areas of terga 1 to 4 with small, sparse punctures. Tergum 5 with large punctures separated by less than 1 diameter. Sterna 1 to 6 with weak shagreening; sternum 1 with medium-sized punctures separated by 2 to 3 diameters; apical margin with well developed, apical, median, V-shaped emargination. Sterna 2 to 6 with medium-sized punctures separated by 2 to 3 diameters except for small, median, basal, impunctate areas. Pygidial plate narrowed apically, moderately recurved, recurved area smooth, basal area with small, crowded punctures, edges lateral to punctured area raised.

Vestiture. – White throughout. Clypeus with hairs sparse medially, more abundant laterally. Supra-antennal area with upper half naked. Scutum with hairs very sparse on posterior two-thirds; scutellum naked except for sparse hairs on extreme lateral margins. Propodeal corbicula with scattered, long hairs in about anterodorsal third. Trochanteral floccus imperfect. Metasomal tergum 1 without an apical fascia, disc naked except for extreme anterior and lateral areas with medium length hairs; terga 2 to 4 with apical fasciae of recumbent hairs obscuring slightly more than one-fourth terga; discs naked except for very short, fine, sparse hairs and sparse, medium length hairs laterally. Tergum 5 completely obscured by long, appressed hairs. Sternum 1 with erect hairs throughout, apical fringe well developed; sterna 2 to 5 with subapical fimbriae and apical fringes well developed laterally but narrowly absent medially; sterna 2 to 6 with sparse, erect hairs throughout except on impunctate, basal, median, anterior areas.

MALE. *Measurements and ratios.* – N = 2; length, 5.6 mm; width, 1.7 mm; wing length, 1.8 and 1.7 mm; FL/FW, 0.95 and 0.96; FS1/FS2, 1.09 and 1.33.

Integumental color. – Black except as follows: antenna beyond flagellar segment 1 yellow-brown beneath; mandible with apical half or less red; mesosoma as in female; metasomal terga and sterna broadly hyaline apically.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 slightly longer than flagellar segment 3; flagellar segment 2 slightly shorter than flagellar segment 3. Eye 3 times longer than wide with inner margin diverging above except for upper end slightly incurved. Malar space, mandible and galea as in female except mandible without ventrobasal lamella. Maxillary palpus with about half apical segment projecting beyond apex of galea, segmental ratio 0.5 : 0.6 : 0.4 : 0.5 : 0.6 : 0.6. Labial palpus as in female except palpal ratio 1.0 : 0.6 : 0.5 : 0.6. Labral process strongly reflexed, twice as wide as long, depth of apical emargination more than one-third length of labral process. Clypeus weakly protuberant; protruding below eyes for two-fifths its length, with large punctures throughout separated by less than one-half diameter except for small, median area where punctures weaker, more widely spaced, surface shiny. Supraclypeal area with irregular, crowded punctures. Genal area twice as wide as eye, produced to a blunt projection opposite midpoint of eye, sculptured as in female. Vertex and supra-antennal areas as in female except supra-antennal area with rugulae less prominent, punctures more prominent. Paraocular area sculptured as for supraclypeal area.

Pronotum with humeral angle and ridge strongly developed except humeral ridge broadly and shallowly depressed medially; pronotal suture indistinct; area between pronotal lobe and humeral ridge with lower half smooth, shiny; remainder of pronotum shagreened, dorsally with medium-sized punctures separated by 1 diameter or more. Remainder of mesosoma as for female except propodeal corbicular area shagreened with large punctures separated by 2 to 3 diameters.

Metasomal terga 1 to 4 as in female except apex of disc with fewer punctures than female and tergum 1 punctured as for terga 2 to 4; tergum 5 similar to female except punctures slightly more widely spaced. Sterna 1 to 6 as in female except whole area with very weak, reticular shagreening, punctured throughout. Sternum 7 (fig. 73) with basal apodemes rounded basally, apex truncate, lateral areas with long hairs. Sternum 8 (fig. 74) with apex and neck region long, 1.5 times longer than basal region; apex and neck region long, 1.5 times longer than basal region; apex moderately expanded, neck with abundant, long hairs. Gonoforceps (figs. 70 to 72) in dorsal and lateral view with strong, longitudinal ridge. Penis valves in dorsal and ventral view with rounded, median expansion, apex bulbous; in lateral view as long as gonoforceps.

Vestiture. – White throughout. Clypeus with abundant, long hairs throughout; polished areas of scutum and scutellum with sparse, short vestiture. Metasomal tergum 1 with sparse, erect hairs throughout, not forming a definite apical fascia; terga 2 to 4 with apical fasciae of nearly recumbent, short hairs, fasciae obscuring about one-fourth or more of terga; tergum 2 with long, sparse, erect hairs on median third, shorter, sparse, erect hairs laterally and on discs of terga 3 and 4. Tergum 5 with medium length, sparse hairs throughout, on sterna 1 to 5 forming thick, subapical fimbriae.

Variation. – This species varies little as is evidenced in the female by the low standard deviations for wing length and the ratio of FL/FW. The higher standard deviation for FOVL/FOVW is due to the difficulty of accurately measuring the facial foveae. The limits of the foveae are indistinct, especially dorsally.

Type material. – The holotype female (UCB no. 11131) was taken at Truckee, Nevada Co., California, by E. G. Linsley on August 17, 1955, at flowers of *Chrysothamnus* sp. The allotype male (UCB no. 11131) has the same data as the holotype female except that it was collected by J. Linsley. Eighty-three females and 1 male paratype are designated as follows: CALIFORNIA, *Nevada Co.*, Boca Dam 18 km E. Truckee, 10 females (UCB), E. G. Linsley, July 24, 1956, on *Chrysothamnus nauseosus speciosus;* 1 female, same data except collected by J. M. Linsley on *Chrysothamnus* sp.; 2 km S. Hobart Mills, 1 female (UCB) E. G. Linsley, September 1, 1957, on *C. n. typicus;* Prosser Creek N. side 3 km S. Hobart Mills, 27 females (UCB) E. G. Linsley, August 24, 1956, females on *Chrysothamnus* sp., male on *C. n. speciosus;* Sagehen near Hobart Mills, 5 females (UCB) E. G. Linsley, August 23, 1956, on *Chrysothamnus* sp.; 18 females, same data as holotype, 13 females same data as holotype except collected August 30, 1955, 1 female, same data as holotype except collected August 31, 1955; *Sierra Co.*, Sierraville, 1 female (UCB) R. F. Smith, August 26, 1948; *Siskiyou Co.*, Lower Klamath Lake, 1 female (JS) J. Schuh, August 14, 1963, on *Melilotus alba.* OREGON, *Klamath Co.*, 10 km W. Bly, 2 females (GEB) W. P. Stephen, August 18, 1955, at 1,406 m; Klamath Falls Experiment Station, 1 female (OSU) P. F. Torchio, August 3, 1960.

Parasites. – None.

Range and localities. – This species has been taken from the northern Sierra of California, and from southern Oregon, (map 10). In all, 84 females and 2 males were examined. All specimens have been collected since 1948. Only one altitude record is given; 1,406 m for 2 females from 10 km W. Bly, Klamath Co., Oregon. All collection data are given under "Type material."

Flight records. – Females have been taken from July 24 to September 1, with all other records except one for August. The 2 males were taken on August 17 and August 24.

Floral records. – Flower records for 80 females and 2 males are: 68 females, 1 male, *Chrysothamnus* sp., (P,N); 10 females, 1 male, *C. nauseosus speciosus,* (P,N); 1 female, *C. n. typicus* (N); 1 female, *Melilotus alba* (N). This species collects pollen only from species of *Chrysothamnus.*

Andrena bocensis is closely related to *A. canadensis,* but may be separated by its smaller size, the integument more shiny, and the clypeus more protuberant with fewer punctures. The two species are allopatric and, because of their close similarity, the possibility exists that *A. bocensis* is a subspecies of *A. canadensis.* However, I believe that *A. bocensis* is sufficiently distinct to warrant specific status.

Andrena (Cnemidandrena) grindeliae Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 10; length, 8.9-9.7 mm; width, 2.8-3.2 mm; wing length, M = 3.12 ± 0.068 mm; FL/FW, M = 0.93 ± 0.077; FOVL/FOVW, M = 2.94 ± 0.247.

Integumental color. – Black except as follows: antenna brown ventrally beyond second flagellar segment; mandible with more than apical half red; tibial spurs yellow; medio- and distitarsi and basal half of tarsal claws yellow, apical half of tarsal claws red; tegula, wing veins, and pterostigma dark brown, wing membrane hyaline except for very slight, apical darkening; metasomal terga and sterna with apical margin narrowly hyaline; pygidial plate red.

Structure. – Scape as long as flagellar segments 1 to 3 plus one-third of flagellar segment 4; flagellar segment 1 equal to flagellar segments 2 plus 3; flagellar segment 2 equal to flagellar segment 3. Eye slightly less than 4 times longer than wide, inner margin subparallel except for upper end somewhat incurved. Malar space 9 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum, notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, dorsal surface wider than lateral surface. Maxillary palpus with half apical segment projecting beyond apex of galea, segmental ratio 1.1 : 1.2 : 0.9 : 0.9 : 0.7 : 1.1. Labial palpus with basal segment laterally flattened and curved, apical segment attached slightly subapically, segmental ratio 1.9 : 0.9 : 1.7 : 1.0. Labral process flattened except apical, lateral areas slightly recurved, more than twice as wide as long, apical emargination depth one-fourth length of labral process. Clypeus moderately protuberant, with very slightly more than half its length projecting below eyes, with large punctures separated by 1 diameter except more widely spaced on lower, median, flattened area; upper peripheral third shagreened, remainder shiny. Supraclypeal area with medium-sized, deep punctures separated by one-half diameter, with very weak shagreening, shiny. Genal area nearly 1.25 times wider than eye, with small to medium-sized punctures separated by one-half to 1 diameter, third nearest eye shiny, remainder shagreened. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, with large, deep punctures separated by 1 diameter, punctures obscured by weak tessellation. Supra-antennal area with longitudinal rugulae and indistinct, interrugal punctures. Facial fovea 3 times longer than wide, slightly narrowed below, rounded above and below, reaching above to a line above median ocellus, reaching below to just below a line below antennal fossa.

Pronotum with humeral angle well developed, humeral ridge well developed below, broadly depressed medially where reached by pronotal suture; with small, scattered punctures dorsally, weakly shagreened throughout. Scutum with small to medium-sized punctures separated by 1 to 3 diameters; anterior half and small posterior area moderately tessellate, dorsal area smooth, shiny. Scutellum medioposteriorly with small punctures, remainder smooth, shiny. Metanotum with small, widely spaced punctures, moderately tessellate. Propodeal enclosure with narrow, anterior fringe of short, longitudinal rugulae, median, longitudinal area depressed, remainder moderately tessellate; dorsoposterior area with medium-sized punctures separated by 2 to 3 diameters; corbicular area with reticular shagreening. Mesepisternum with large punctures separated by 2 diameters, with reticular shagreening. Metepisternum with very small, sparse punctures dorsally, and very fine, reticular shagreening, nearly shiny. Mesobasi-

tarsus expanded medially, 3 times longer than wide, equal in width to metabasitarsus. Metabasitarsus widest in basal fourth, slightly more than 4 times longer than wide, four-fifths width of metatibia. Metatibia cuneate, 4.3 times longer than wide. Wing with pterostigma 4 times longer than wide; vein 1st m-cu meets second submarginal cell one-fourth of distance from apex.

Metasomal tergum 1 with medium-sized punctures separated by 2 diameters except punctures more widely spaced medially, whole area weakly tessellate; terga 2 to 4 with small to medium-sized punctures separated on discs by 3 or more diameters, on apical margins of discs by less than 2 diameters, with weak tessellation except depressed apical areas with reticular shagreening. Tergum 5 with large punctures separated by 2 or more diameters, with reticular shagreening. Pygidial plate rounded and slightly downturned apically, flat, with very small crowded punctures. Sternum 1 with small, median, V-shaped emargination, sterna 1 to 5 with medium-sized punctures separated by 2 diameters except punctures smaller basally and larger, more widely spaced on sternum 1; sternum 6 with medium-sized punctures apically, sternum 1 with very weak, reticular shagreening, sterna 2 to 6 with reticular shagreening.

Vestiture. – White. Clypeus with sparse hairs in broad, median area; scutum naked on shiny, dorsal area, scutellum naked except for posterior and lateral edges, propodeal corbicula with scattered hairs in anterodorsal third, trochanteral floccus nearly perfect. Metatibial scopa with hairs of posterior face with very short branches on inner side. Metasomal terga 1 to 4 with complete apical fasciae; fascia of tergum 1 with hairs nearly erect, not obscuring surfaces, fasciae of terga 2 to 4 with hairs appressed, obscuring about one-third of terga, discs of terga 2 to 4 with very short, sparse, erect hairs, tergum 5 obscured by long, recumbent hairs. Sternum 1 with sparse, long, erect hairs; sterna 1 to 5 with apical fringes of very short, appressed hairs, subapical fimbriae present in lateral thirds, fimbrial hairs barbed on inner sides; remainder of sternal areas with erect hairs, hairs becoming shorter anteriorly.

Variation. – All specimens are similar except for slight differences in overall size.

Type material. – The holotype female (UCD no. 406) was collected by J. G. Rozen at Tesla, Alameda Co., California, on October 4, 1951. Nine paratype females are designated as follows: 1 female, same data as holotype; *Alameda Co.*, Tesla, 1 female (UCB) P. D. Hurd on September 25, 1948, on *Eriogonum* sp.; *Contra Costa Co.*, 1 female (PHT) E. G. Linsley, September 12, 1936, on flowers of *Grindelia* sp.; *San Mateo Co.*, Palo Alto, 1 female (UCB) J. Nichols, 1916; *Santa Clara Co.*, Stanford University, 4 females (PHT) P. H. Timberlake, September 6, 1943, at flowers of *Hemizonia luzulaefolia*, 1 female (UCD) P. H. Arnaud, October 21, 1951.

Parasites. – None.

Range and localities. – *A. grindeliae* is found only in the San Francisco Bay area of California (map 9). All locality data are given under "Type material." This species is known only from 10 females.

Flight records. – Collection dates range from September 6 to October 21.

Floral records. – Flower records of 6 females are: 1 female, *Eriogonum* sp., (N); 1 female, *Grindelia* sp., (P); 4 females, *Hemizonia luzulaefolia* (N). Only 1 female has collected pollen, and that is from a species of *Grindelia.*

Males are unknown for this species, but the females would seem to fit better within the Nubecula group than elsewhere. The vestiture is white, the wings hyaline, and metasomal tergum 1 has a thin apical fascia. The species has been taken from only a few locations near San Francisco in California, and is therefore allopatric to both *A. bocensis* and *A. canadensis*, the two species with which it would seem to be mostly closely related. Its large size and thin apical fascia on tergum 1 distinguish it from other species within the Nubecula group.

Andrena (Cnemidandrena) citrinihirta Viereck

Andrena (Andrena) citrinihirta Viereck, 1917, Trans. Am. Entomol. Soc. 43:371 female; Cresson, 1929. Mem. Am. Entomol. Soc. 5:59 (list).

Andrena (Cnemidandrena) citrinihirta, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley in Muesebeck et al., 1951. U.S. Dep. Agric. Agric. Monogr. 2:1061.

FEMALE. *Measurements and ratios.* – N = 20; length, 6.6-7.9 mm; width, 1.9-2.5 mm; wing length, M = 2.22 ± 0.097 mm; FL/FW, M = 1.03± 0.096; FOVL/FOVW, M = 3.23 ± 0.328.

Integumental color. – Black except as follows: last several segments of antenna lighter than remainder; mandible with apical half red; tibial spurs nearly white; tarsi, except basitarsi, yellow-brown; tarsal claws with basal half light yellow, apical half red; tegula shining brown, wing veins red-brown, pterostigma yellow-brown, wing membrane nearly black apically in anterior half, remainder of apical area lightly clouded; metasomal terga and sterna broadly hyaline apically, pygidium dark red.

Structure. – Scape equal in length to flagellar segments 1 to 3; flagellar segments 1 and 2 equal in length. Eye 4 times longer than wide with inner margin diverging slightly above except upper end inwardly curved. Malar space 7 times as wide as long. Mandible in repose extends for one-fifth its length beyond middle of labrum; notch of mandible tooth less than one-half distance between middle of labrum and mandible apex. Galea moderately tessellate, lateral surface as wide as dorsal surface. Maxillary palpus long, with at least apical segment projecting beyond apex of galea, segmental ratio 0.7 : 0.8 : 0.7 : 0.6 : 0.5 : 0.5. Labial palpal basal segment flattened laterally, curved, with apical half twisted exposing inner flattened face from above, apical segment attached subapically, segmental ratio 0.9 : 0.5 : 0.4 : 0.5. Labral process moderately reflexed, twice as wide as long, median emargination shallow, depth one-fourth length of labral process. Clypeus protuberant, most protuberant medially; extending for more than one-third its length below eyes; median, longitudinal third smooth, lateral thirds with large punctures separated near median margin by 1 diameter, smaller, more crowded dorsolaterally, dorsolateral periphery shagreened. Supraclypeal area with small punctures laterally, shagreened medially. Genal area more than 1.3 times as wide as eye, with medium-sized punctures separated by 2 to 4 diameters, area near eye margin one-third width of genal area, surface shiny, remainder shagreened. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, with reticular shagreening obscuring punctures. Supra-antennal area with distinct, longitudinal rugulae and obscure punctures in interrugal spaces. Facial fovea more than 3 times longer than wide, wider above than below, rounded above and below, upper limits indistinct, ending above at a line above dorsal limit of median ocellus, ending below slightly below antennal fossa.

Pronotum with humeral angle and ridge moderately developed except humeral ridge almost lacking in upper half; pronotal suture weak; pronotum shagreened throughout. Scutum in anterior half with moderate reticular shagreening, with irregular punctures separated by 1 to 3 diameters; dorsomedian area of posterior half smooth, shiny. Scutellum smooth, polished, except for posterior margin shagreened with medium-sized punctures separated by 2 diameters. Metanotum irregularly tessellate with obscure punctures separated by 2 diameters. Propodeal enclosure with light, reticular shagreening except anterior third with irregular, transverse rugulae; dorsoposterior surface with reticular shagreening and small punctures separated by 2 diameters; corbicular areas moderately shagreened with a few, scattered, prominent punctures in anterodorsal fourth, surface shiny. Mesepisternum with moderate shagreening, surface shiny, and moderate punctures separated by 3 to 4 diameters. Metepisternum weakly shagreened, with median three-fifths impunctate, shiny; upper and lower areas with small punctures separated by 2 to 3 diameters. Mesobasitarsus widest medially, 2.6 times longer than wide, somewhat wider than metabasitarsus. Metabasitarsus widest just above middle, one-fourth longer than mesobasitarsus. Metatibia wider than mesobasitarsus, 1.3 times as long as metabasitarsus. Vein 1st m-cu meets second submarginal cell at middle; pterostigma 4 times as wide as long.

Metasomal terga 1 to 5 with reticular shagreening on disc except for smooth posterior margin; apical areas smooth. Tergum 1 with scattered punctures medially and laterally on disc, terga 1 to 4 with posterior areas of discs and apical areas except extreme apical edges with punctures at closest separated by less than 1 diameter. Tergum 5 with small punctures on disc separated by 2 diameters, crowded posteriorly. Pygidial plate rounded apically, with edge and narrow median area raised. Sternum 1 with small, median, V-shaped, apical emargination with medium-sized punctures separated by 3 to 4 diameters; sterna 1 to 6 moderately shagreened; sterna 2 to 6 with small punctures separated by 3 diameters.

Vestiture. – Pubescence citrus yellow throughout but slightly less colored beneath. Clypeus with median third naked. Scutum with short, thick, posteriorly directed hairs. Propodeal corbicula with widely spaced hairs in anterior fourth; trochanteral floccus imperfect. Metasomal terga 1 to 4 with complete apical fasciae of short, dense, appressed hairs obscuring more than half of terga. Tergum 1 with a small, lateral, naked area just anterior to the apical fascia, remainder of disc covered with long, nearly erect hairs. Tergum 2 with disc with very short, appressed hairs in narrow median area and laterally; remainder of disc and discs of terga 3 and 4 with very short, exceedingly fine, sparse, erect hairs. Tergum 5 covered with appressed hairs. Sternum 1 with long, sparse, erect hairs; sterna 2 to 6 with weak,

apical fimbriae, poorly developed in median thirds, remaining areas with short, fine, sparse, erect hairs. Sterna 1 to 5 with apical fringes of short, white hairs, well developed on sternum 1, poorly developed on sterna 2 to 5.

MALE. *Measurements and ratios.* – N = 20; length, 6.5-5.8 mm; width, 1.4-1.7 mm; wing length, M = 2.56 ± 0.100 mm; FL/FW, M = 1.02 ± 0.010; FS1/FS2, M = 1.16 ± 0.072.

Integumental color. – Black except as follows: antenna light brown ventrally beyond scape; mandible with apical half clear bright red; tarsi light yellow-brown, tarsal claws with apical half dark red; tegulae shining light brown except narrow edge hyaline; wing veins and pterostigma red-brown, wing membrane hyaline except for apical area moderately darkened. Metasomal terga 1 to 5 widely hyaline apically; sterna 1 to 6 narrowly hyaline apically.

Structure. – Scape short, equal in length to pedicel plus flagellar segments 1 and 2; flagellar segment 1 a little longer than flagellar segment 2, as long as flagellar segment 3. Eye a little more than 3 times as long as wide with inner margin diverging slightly above except upper end somewhat incurved. Malar space extremely short, 12 times wider than long. Mandible in repose extends for almost one-third its length beyond middle of labrum; notch of mandible tooth less than half distance between middle of labrum and mandible apex from mandible apex. Galea as in female. Maxillary palpus with last two segments projecting beyond apex of galea; segmental ratio 0.6 : 0.7 : 0.6 : 0.6 : 0.5 : 0.6. Labial palpus with basal segment strongly flattened laterally and curved, apical segment attached subapically, segmental ratio 0.8 : 0.4 : 0.4 : 0.5. Labral process strongly reflexed, wider than long, median emargination depth one-third length of labral process. Clypeus slightly protuberant; extending for one-fourth its length below eyes; whole surface with medium-sized punctures separated by 1 diameter except for lower median area where punctures separated widely; surface shiny throughout. Supraclypeal, supra-antennal areas as in female. Genal area nearly twice as wide as eye, weakly produced opposite midpoint of eye to a blunt projection, with small punctures separated by 3 to 5 diameters, lightly shagreened. Paraocular area below upper limit of antennal fossa with large punctures separated by less than 1 diameter, shiny; above as for supra-antennal area. Vertex as in female.

Pronotum with humeral angle and ridge well developed, shagreened with weak, vertical rugulae above indistinct pronotal suture; remainder of thorax as in female. Wings as in female except membrane less clouded apically. Metasomal terga 1 to 5 with some weak shagreening on basal areas of discs; otherwise smooth, shiny, with small punctures separated by 4 diameters. Sternum 1 broadly emarginate medially; sterna 1 to 6 with moderate shagreening. Sternum 7 (fig. 78) with basal apodemes narrowing anteriorly; shallowly emarginate apically, processes on each side of emargination truncate with numerous hairs. Sternum 8 (fig. 79) with apex and neck region longer than basal region; apex truncate; neck region with abundant, long hairs. Gonoforceps (figs. 75 to 77) in dorsal view flattened, expanded apically. Penis valves strongly bent downwards, projecting well below gonoforceps, weakly expanded laterally, lateral expansions smoothly rounded, penis slightly wider medially than basally.

Vestiture. – Pubescence yellow throughout except slightly less colored ventrally and sternal apical fringe white. Terga 1 to 5 with apical fasciae obscuring one-third of terga; fasciae of short, nearly erect hairs inclined laterally in lateral thirds. Disc of tergum 1 with long, erect hairs, disc of tergum 2 with medium length erect hairs in small anteromedian area, with much shorter, erect hairs laterally; short, erect hairs on discs of terga 3 to 5. Sterna 1 to 6 with apical fringes of short, dense hairs, with longer, erect hairs on remaining areas.

Variation. – In both sexes the integument may be brown or brown-yellow. The smooth, shiny area on the scutum and scutellum varies slightly in size. The amount and intensity of sculpture on the metasomal terga varies, becoming almost finely tessellate basally in some specimens. Vein 1st m-cu meets the second submarginal cell slightly before or well beyond the middle in about one-fourth of the specimens. Some variation may be found in individuals. One male from Clear Creek, San Benito Co., California, has the second submarginal cell in both wings about half as wide as normal.

Type material. – The holotype female (ANSP no. 4040) was collected by E. Norton in California. The neallotype male (UCD) (here designated) was collected by L. Bruner in California, Sacramento Co., on October 6, 1916.

Parasites. – One male from 10 km N.E. Hanford, Kings Co., California, carries 1 triungulin ventrally on its head.

Range and localities. – The species is limited in California to the Central Valley and areas west, plus one male from Kern Co., 21 km W. Lebec. One male is from southern Oregon (map 11). A total

of 64 females and 37 males were examined. All collection localities are listed below.

CALIFORNIA. *Contra Costa Co.:* Antioch. *Kern Co.:* 21 km W. Lebec. *Kings Co.:* 10 km N.E. Hanford. *Placer Co.:* Auburn. *Sacramento Co.:* Sacramento. *San Benito Co.:* Clear Creek. *Siskiyou Co.:* Gazelle. *Stanislaus Co.:* Turlock.

OREGON. *Harney Co.:* Antelope Mountain.

Flight records. – Females have been taken from September 10 to October 10, and males have been taken from August 17 to October 6. Except for one male taken on August 17, all collection dates for both sexes are in September and October.

Floral records. – *A. citrinihirta* has been taken collecting pollen from two flower genera, both within the Astereae. In all, 16 females and 11 males have been taken on the following flower species: 1 female, *Heterotheca grandiflora* (P,N); 5 females, 2 males, *Solidago* sp., (P,N); 1 female, 6 males, *S. californica* (N); 9 females, 3 males, *S. occidentalis* (P,N).

This species is very close to *A. aurihirta,* but it is a little smaller, especially in the males, and can be distinguished by the clypeus being more protuberant and nearly naked in the lower median area, the propodeal enclosure without a longitudinal, median depression, and the lateral areas of metasomal tergum 2 anteriorly to the apical fascia with all hairs short and appressed. *A. citrinihirta* is found in the Central Valley of California and as far north as southern Oregon, and *A. aurihirta* is found in the Santa Barbara Mountains of southern California, north to the Tehachapi Mountains, and for a short distance north of the Tehachapis along the Sierra Nevada. The two species are allopatric but nearly meet in the Tehachapi region (map 11).

An original parent population probably extended throughout California, but may have been exterminated in the Sierra by climatic changes, with two populations surviving in refuges, one in the San Francisco Bay area and one in the higher, non-glaciated areas of southern California. Amelioration of the climate since the last Ice Age would have permitted the two now distinct species to reinvade much of the former range and to almost meet in at least one area.

These two species are separable from other species in the Citrinihirta group by their citrus yellow vestiture. Metasomal vestiture links these two species to both *A. ramaleyi* and *A. sulcata,* and more distantly to *A. bendensis.*

Andrena (Cnemidandrena) aurihirta Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 20; length, 7.9-9.0 mm; width, 2.3-2.7 mm; wing length, M = 2.42 ± 0.114 mm; FL/FW, M = 1.03 ± 0.059; FOVL/FOVW, M = 3.01 ± 0.283.

Integumental color. – Black except as follows: antenna with distal several flagellar segments lighter than remainder; mandible with apical half red; tibial spurs and distitarsi light yellow; tegula shining light brown, wing veins light brown-yellow; wing membrane moderately clouded apically; metasomal terga and sterna widely hyaline apically; pygidial plate dark red except for lateral raised areas light yellow in apical half.

Structure. – Scape slightly longer than flagellar segments 1 to 3; flagellar segment 1 slightly shorter than flagellar segments 2 plus 3. Eye 4 times as long as broad with inner margin diverging very slightly above except for upper end incurved. Malar space very short, 9 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum; notch of mandible tooth one-fourth of distance between middle of labrum and mandible apex from middle of labrum. Galea moderately tessellate, dorsal surface slightly wider than lateral surface. Maxillary palpus reaching slightly beyond apex of galea, segmental ratio 0.7 : 0.8 : 0.7 : 0.7 : 0.6 : 0.6. Labial palpus with basal segment flattened and curved laterally, apical segment attached subapically, subapical segment slightly so; segmental ratio 1.2 : 0.6 : 0.5 : 0.5. Labral process nearly flat, wide basally, twice as wide as long; apical emargination shallow, depth one-fourth length of labral process. Clypeus moderately protuberant, extending for more than one-third its length below lower level of eyes; dorsolateral fourth with large punctures separated by 1 diameter and area shagreened, remaining area with few, scattered

punctures, smooth, shiny. Supraclypeal area with indistinct, broad, shallow punctures and light shagreening. Genal area about twice as wide as eye, with small punctures separated by 4 diameters, with indistinct shagreening posteriorly, surface shiny. Vertex above lateral ocellus equals 1 ocellar diameter, with weak tessellation. Supra-antennal area with longitudinal rugulae and obscure punctures, surface shiny. Facial fovea 3 times longer than wide, extending dorsally to a line below lateral ocellus, ventrally to a line below antennal fossa, rounded above, narrowed below.

Pronotum with humeral angle and ridge moderately developed, with reticular shagreening, pronotal suture weakly crossing humeral ridge. Scutum with small punctures separated by 3 to 4 diameters; anterior third with light shagreening, dorsal area nearly polished, moderately shiny. Scutellum with small, sparse, scattered punctures posteriorly, shiny. Metanotum shagreened, shiny. Propodeal enclosure with a broad, median, longitudinal depression, irregular transverse rugulae with scattered light tessellation; surface shiny; dorsoposterior areas shagreened, shiny, with small punctures separated by 2 to 4 diameters, lateral corbicular area with medium-sized punctures in anterodorsal fifth separated by 5 or more diameters, with reticular shagreening, shiny. Mesepisternum shagreened with small punctures above separated by 2 to 4 diameters; more widely scattered, less distinct below. Metepisternum shagreened. Mesobasitarsus widest medially, 2.5 times as long as wide, wider than metabasitarsus, as wide as metatibia. Metabasitarsus less than 4 times as long as broad, metatibia expanded apically, 3.5 times as long as wide. Wings with pterostigma 4 times as long as wide; vein 1st m-cu meets second submarginal cell slightly beyond middle.

Metasomal terga 1 to 4 with weak reticular shagreening, shiny, with small punctures laterally and medially separated by 3 diameters, punctures closer apically. Tergum 5 with reticular shagreening, shiny, and large punctures separated anteriorly by 1 diameter, crowded apically. Pygidial plate with apex rounded, narrow median longitudinal area raised, broad edges turned up. Sternum 1 with small apical median, V-shaped emargination with medium-sized punctures separated by 1 diameter, lightly shagreened. Sterna 2 to 6 shagreened except for narrow apical margins hyaline, punctures small, close.

Vestiture. – Citrus yellow throughout except less colored ventrally and facial foveal hair yellow-white. Clypeus with hairs sparse or absent in lower median half. Scutum with abundant hairs, hairs short, close, medially. Scutellum with anterior half nearly naked. Propodeal corbicula with long, well spaced hairs in anterodorsal fifth. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with appressed apical fasciae obscuring more than half terga. Tergum 1 with remainder of disc with close, long, erect hairs. Disc of tergum 2 with long, erect hairs on anterior median third; shorter, erect hairs on lateral anterior fifths; small, lateral areas between apical fascia and anterior erect hairs with very short, appressed hairs. Terga 3 to 4 with very short, sparse, erect hairs on discs. Tergum 5 almost obscured by long, posteriorly directed hairs. Sternum 1 with long, erect hairs and well-developed apical fringe; sterna 2 to 5 with subapical fimbriae poorly developed in about median thirds, well developed laterally, apical fringes moderately developed, remaining areas with short, sparse, erect hairs except small, anterior median areas naked.

MALE. *Measurements and ratios.* – N = 20; length, 5.8-8.8 mm; width, 1.4-2.5 mm; wing length, M = 2.92 ± 0.138; FL/FW, M = 0.97 ± 0.071; FS1/FS2, M = 1.27 ± 0.101.

Integumental color. – Black except as follows: antenna red-brown ventrally in apical half, mandible with apical third red; legs brown, tibial spurs nearly white; basal half of tarsal claws light yellow, distal half red. Tegula shining brown, wing veins brown, wing membranes moderately clouded apically, metasomal terga and sterna with apical margins widely hyaline.

Structure. – Scape equal to pedicel plus flagellar segments 1 and 2; flagellar segment 1 more than 1.25 times as long as flagellar segment 2. Eye nearly 3.5 times as long as broad, inner margin diverging slightly dorsally except upper end incurved. Malar space, mandible and galea as in female except mandible with tooth notch one-third distance between middle of labrum and mandible apex from middle of labrum, and mandible without ventrobasal lamella. Maxillary palpus as in female except segmental ratio 0.8 : 0.8 : 0.7 : 0.5 : 0.6 : 0.6. Labial palpus as in female except segmental ratio 1.1 : 0.5 : 0.5 : 0.5. Labral process strongly reflexed, twice as wide as long, median emargination depth half length of reflexed area. Clypeus slightly protuberant, extending below eyes for two-fifths of its length, with large punctures separated medially by 3 diameters, crowded on dorsolateral periphery, surface shiny. Supraclypeal area with large, crowded punctures. Gena produced to a blunt angle posteriorly; twice as wide as eye, with small punctures throughout separated by 5 diameters; posterior half shagreened, anterior half shiny. Supraclypeal and paraocular areas with poorly developed rugulae and medium-

sized punctures 2 to 3 diameters apart. Vertex 1.5 times diameter of lateral ocellus with weak tessellation and msall punctures separated by 3 to 4 diameters.

Pronotum with humeral angle and ridge well developed, pronotal suture reaching humeral ridge; shagreened above and anterior to humeral angle and ridge; vertical rugulae below humeral angle and above pronotal suture shiny; remaining area between humeral ridge and pronotal lobe smooth, polished. Scutum, scutellum and metanotum as in female. Propodeal enclosure with a well defined, median longitudinal depression with transverse rugulae in about posterior half, anterior half with irregular rugulae, areas laterally to median depression with light tessellation, whole enclosure shiny. Propodeal dorsoposterior area weakly shagreened, shiny, with medium-sized punctures separated dorsally by 1 1/2 to 2 diameters, laterally by 3 to 4 diameters. Mesepisternum, metepisternum, and wings as in female.

Metasomal terga 1 to 5 with discs polished with small punctures separated on discs by 3 to 4 diameters, more crowded on apical margins of discs. Sternum 1 with shallow, median emargination; sterna 1 to 6 with small, shagreened areas basally, remainder polished, with small punctures separated by 6 to 8 diameters. Sternum 7 (fig. 83) with basal apodemes turned slightly inwards; emarginate apically, processes on each side of emargination with short, sparse hairs. Sternum 8 (fig. 84) with apex and neck region longer than basal region; apex rounded; neck with abundant, long hairs throughout. Gonoforceps (figs. 80 to 82) in dorsal view flattened, moderately expanded apically; in lateral view nearly straight. Penis valves strongly curved downward, lateral expansions smoothly curved.

Vestiture. – Pubescence citrus yellow dorsally, nearly white ventrally. Terga 1 to 5 with apical fasciae of short hairs nearly appressed apically, becoming erect on disc, erect hairs on discs of terga 1 and 2 long, but tergum 2 with erect hairs shorter than erect hairs of tergum 1; erect hairs of terga 3 to 5 very short, shortest laterally. Sterna 1 to 6 with sparse, medium length hairs throughout; apical fringes strongly developed on sterna 2 to 5, hairs long.

Variation. – In both sexes the integumental color may vary from black to light red-brown throughout except for antennae. One female taken at Lone Pine Lake, Inyo Co., California, has the pronotum on the left side with a distinct horizontal ridge running posteriorly from the ventral end of the humeral ridge to the posterior margin of the pronotum; the right side is normal. In both sexes the sculpturing of the propodeal enclosure varies somewhat; about one-fourth of the females have little or no median depression; in males the median depression is always present, but the area anterior to this with irregular rugulae may vary in extent posteriorly.

Type material. – The holotype female (UCD no. 404) was collected at Riverside, Riverside Co., California, by P. Timberlake on October 14, 1933, at flowers of *Isocoma vernonioides.* The allotype male (UCD) was collected at Riverside, Riverside Co., California, by F. R. Platt on September 23, 1936, at flowers of *Heterotheca* sp.

Forty-seven females and 27 males are designated as paratypes. All specimens (PHT) were collected by P. H. Timberlake at Riverside, Riverside Co., California, from 1926 to 1957 between September 1 and November 6.

Parasites. – One male from Big Pine, Inyo Co., and one male from Riverside, Riverside Co., are each carrying one female stylops in their abdomens. The allotype male bears a triungulin on the clypeal pubescence. One male from Barton Flat, San Bernardino Co., carries two triungulins ventrally on the head. One male and two females from South Fork Camp, San Bernardino Co., carry respectively seven triungulins on the mesosoma, one triungulin on the mesosoma, and one triungulin dorsally on the metasoma.

Range and localities. – This species is limited to the high mountain areas of southern California (map 11), extending from Riverside County in the south to Mono County in the north. About 80 percent of the specimens were taken in San Bernardino Co., and Riverside Co., in the Santa Ana River area. Only one altitude record is given; 1,937 m at South Fork, Santa Ana River, San Bernardino Co. Totals of 151 females and 127 males were examined. All locality records are listed below.

CALIFORNIA. *Inyo Co.:* Big Pine, 13 km S. Big Pine, 2 km S. Lone Pine, Lone Pine Lake. *Kern Co.:* 4 km W. Frazier Park, 19 km W. Lebec, Walker Pass. *Mono Co.:* Benton Station. *Riverside Co.:* Pinyon Flat, Riverside. *San Bernardino Co.:* Barton Flats, Barton Flat Sugar Loaf, Erwin Lake San Bernardino Mountains, Forest Home, Upper Santa Ana River. *Tulare Co.:* Chimney Meadows S. Fork Kern River.

Flight records. – Collection dates for females range from August 18 to November 6, and for males

from August 24 to October 28, with about 80 percent of all collection dates for both sexes in September and early October.

Floral records. – Females take pollen from species within the Astereae, but chiefly from *Isocoma vernonioides.* A total of 99 females and 78 males of *A. aurihirta* have been taken on the flower species listed below: 2 females, 3 males, *Baccharis emoryi* (P,N); 3 males, *Chrysothamnus* sp.; 18 females, 9 males, *Chrysothamnus nauseosus* (P,N); 1 female, 1 male, *C. n. consimilis* (N); 1 male, *C. n. mohavensis;* 1 female, *C. n. occidentalis* (P,N); 1 female, 2 males, *C. parryi* (P,N); 2 females, 3 males, *C. pumilis* (P,N); 12 females, 5 males, *C. viridulus* (P,N); 1 male, *Erigeron* sp.; 1 male, *Gutierrezia californicus;* 1 female, 8 males, *G. sarothrae* (N); 2 males, *Heterotheca* sp.; 60 females, 22 males, *Isocoma vernonioides,* (P,N); 6 males, *Senecio ionophyllos;* 2 males, *Solidago* sp.; 4 males, *S. affinis;* 1 female, 4 males, *S. californica* (N); 1 male, *S. occidentalis.*

This species is closely related to *A. citrinihirta,* but is a little larger, especially in the males, has the clypeus slightly less protuberant, the propodeal enclosure with a median, longitudinal depression, and metasomal tergum 2 laterally and anteriorly to the subapical fascia with a small patch of short, appressed hairs surrounded by short, erect hairs.

Andrena (Cnemidandrena) ramaleyi Cockerell

Andrena ramaleyi Cockerell, 1931, Ann. Mag. Nat. Hist. (10) 7:346-347 female; 1931, Am. Mus. Novit. 458:14 (key).

Andrena (Cnemidandrena) ramaleyi, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1079.

FEMALE. *Measurements and ratios.* – N = 11; length, 7.0-8.2 mm; width, 2.4-2.8 mm; wing length, M = 2.29 ± 0.104 mm; FL/FW, M = 1.0 ± 0.017; FOVL/FOVW, M = 3.12 ± 0.237.

Integumental color. – Black except as follows: antenna ventrally with apex of flagellar segments 1 and 2 yellow, remaining flagellar segments bright yellow, with only a narrow dorsal area black to flagellar segment 7; mandible with apical half red; tibial spurs white tinged with yellow; tarsi except basitarsi and basal half of tibial claws bright yellow, apical half of tibial claws red; tegula hyaline light brown; wing veins and pterostigma moderately yellow-brown; wing membrane very faintly clouded apically, remainder hyaline; metasomal terga with apical, depressed area hyaline; tergum 1 with lateral reflexed area hyaline, pygidial plate brown-black apically, red-yellow basally; sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 to 3 plus one-third of flagellar segment 4; flagellar segment 1 slightly longer than flagellar segments 2 plus 3; flagellar segment 3 equal to flagellar segment 4. Eye more than 4 times longer than wide, with inner margin diverging moderately above except for upper end slightly incurved. Malar space 8 times wider than long. Mandible in repose extends for one-fourth its length or slightly more beyond middle of labrum, with notch of mandible tooth slightly more than one-third distance between middle of labrum and mandible apex from middle of labrum. Galea weakly to moderately tessellate, dorsal surface one-third wider than lateral surface. Maxillary palpus with apical segment extending beyond apex of galea, segmental ratio 0.7 : 0.7 : 0.6 : 0.5 : 0.5 : 0.6. Labial palpus with basal segment laterally compressed and curved, apical segment attached subapically, segmental ratio 1.0 : 0.6 : 0.4 : 0.6. Labral process slightly reflexed apically, slightly more than twice as wide as long, apical emargination depth one-fourth length of labral process. Clypeus moderately protuberant, extending below eyes for two-fifths its length, with large punctures except for small, impunctate, ventromedian area; punctures separated by 1 diameter or less medially, punctures smaller, closer laterally and dorsally, very light shagreening on narrow upper periphery, remainder shiny. Supraclypeal area with small, irregular punctures and very light shagreening. Genal area wider than eye with medium-sized punctures irregularly spaced, third nearest eye shiny, remainder with moderate shagreening. Vertex equal to 1 ocellar diameter with medium-sized to large deep punctures closely spaced, with light shagreening, nearly shiny. Supra-antennal area with irregular, longitudinal rugulae and small to medium-sized punctures separated by 1 to 2 diameters. Facial fovea slightly more than 3 times longer than wide, wider above than below, rounded above and below, reaching above to a line above median ocellus, reaching below to a line equidistant between antennal fossa and clypeus.

Pronotum with humeral angle well developed, humeral ridge very well developed, humeral ridge not depressed where reached by indistinct, pronotal suture, pronotum dorsally with medium-sized punc-

tures separated by 1 to 2 diameters, posterior margin of pronotum moderately shagreened, remainder shiny. Scutum anteriorly with medium-sized punctures separated by 1 to 2 diameters, dorsal area with very few, scattered punctures, very shiny. Scutellum almost impunctate, smooth, shiny. Metanotum with very few punctures, shagreened laterally, almost smooth and shiny medially. Propodeal enclosure with a broad, median, longitudinal, moderately tessellate depression, tessellation roughened anteriorly; dorsoposterior surface with nearly large punctures separated by 2 to 4 diameters, with light shagreening; corbicular area with widely spaced, medium-sized punctures in anterior third, smooth, shiny. Mesepisternum with large punctures separated by 1 diameter, with light shagreening in anterior two-thirds, remainder shiny. Metepisternum impunctate, smooth, shiny. Mesobasitarsus widest medially, more than 3 times longer than wide, slightly wider than metabasitarsus. Metabasitarsus widest medially in basal third, 4 times longer than wide, slightly more than two-thirds as wide as metatibia. Metatibia widest apically, 3.3 times longer than wide. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-third distance from apex of cell.

Metasomal tergum 1 with medium-sized punctures except for very small, median, impunctate area and depressed, apical margins, punctures separated by 1 to 2 diameters, lightly shagreened; terga 2 to 4 similar except punctured throughout with punctures closer on apical margins of discs; tergum 5 with very large, deep punctures separated by less than 1 diameter, moderately shagreened. Pygidial plate rounded apically, median area and wide lateral areas raised, posterior half weakly reflexed, smooth, anterior half of median area with small, contiguous punctures. Sternum 1 with very small, median emargination, with medium-sized punctures separated by 1 diameter except for anterior median area and impunctate hyaline apex.

Vestiture. – Light white-yellow throughout. Clypeus with sparse hairs medially. Scutum, scutellum and metanotum almost naked on shiny areas. Propodeal corbicula with scattered, plumose hairs in anterior third. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with apical fasciae of recumbent hairs obscuring half or more of terga, fascia of tergum 1 less dense with hairs more erect, not wholly obscuring surface, with long, erect hairs on remaining area except for small, median, impunctate area; terga 2 to 4 with shorter, erect hairs medially on discs, long, erect hairs laterally. Tergum 5 almost obscured by dense, reclining hairs. Sternum 1 with long, erect hairs. Sterna 2 to 5 with long, nearly erect, subapical fimbriae in outer thirds, less developed in median thirds; poorly developed apical fringes on lateral margins of apical areas; sterna 2 to 6 with short, erect hairs on punctured areas.

MALE. *Measurements and ratios.* – N = 3; length 7.0-8.0 mm, width 1.9-2.1 mm; wing length 2.20-2.28 mm; FL/FW, 0.91; FS1/FS2, 0.77.

Integumental color. – Black except as follows: antennae bright yellow ventrally beyond pedicel; mandible with about apical third red; tibial spurs as in female; tarsi and basal half of tarsal claws light yellow; apical half of tarsal claws red; tegula and wing veins as in female, wing membrane hyaline; metasomal terga with apex of disc narrowly light yellow, apical area hyaline, tergum 1 with lateral, reflexed area hyaline, sterna hyaline apically.

Structure. – Scape equal to flagellar segments 1 plus 2 plus half of flagellar segment 3; flagellar segment 1 slightly longer than flagellar segment 2, equal to flagellar segment 3. Eye less than 4 times longer than wide, with inner margin diverging moderately above except for upper end slightly incurved. Malar space and mandible as in female, except mandible without ventrobasal lamella. Galea weakly tessellate, surface nearly shiny. Maxillary palpus as in female except segmental ratio 0.7 : 0.7 : 0.5 : 0.6 : 0.6 : 0.7. Labial palpus as in female except basal segment not so strongly compressed laterally, segmental ratio 1.2 : 0.6 : 0.6 : 0.7. Labial process strongly reflexed, twice as wide as long, apical emargination depth one half of reflexed area. Clypeus as in female except punctures smaller, shagreening almost absent. Supraclypeal area with irregular, close punctures, slight shagreening. Genal area produced to a blunt prominence posteriorly opposite midpoint of eye; genal area twice as wide as eye, shiny. Vertex as in female. Supra-antennal area with irregular, longitudinal rugulae with medium-sized punctures separated by 1 diameter; paraocular areas similarly punctured but rugulae lacking.

Pronotum with humeral angle and ridge well developed; humeral ridge slightly depressed where crossed by pronotal suture; humeral area lightly shagreened to shiny. Remainder of mesosoma sculptured much as in female.

Metasomal terga 1 to 4 with disc with small punctures 3 to 4 diameters apart, punctures closer on disc of tergum 5, terga 1-5 shiny. Sterna 1-6 as in female. Sternum 7 (fig. 88) with basal apodemes narrowing gradually, apex truncate, with lateral angles with long hairs. Sternum 8 (fig. 89) with apex

and neck region a little longer than basal region, apex scarcely expanded, neck with abundant long hairs. Gonoforceps (figs. 85 to 87) in dorsal and ventral view expanded apically, in lateral view scarcely turned down apically. Penis valves in dorsal and ventral view widest medially, in lateral view long, scarcely turned down apically, projecting little below gonoforceps.

Vestiture. – White or near white throughout. Face with long dense pubescence. Mesosomal pubescence long and dense except less dense on disc of scutum. Metasomal terga 1-4 with apical fasciae of recumbent hairs almost obscuring half terga; remaining areas of terga 1-4 with long, more widely spaced, erect hairs, hairs shorter from terga 1 to 4. Tergum 5 similar to tergum 4 but hairs not forming a definite apical fascia. Sternum 1 with sparse, long hairs, sterna 2-5 apically with dense, long fringes, remaining areas with shorter, more widely spaced hairs.

Variation. – In females the facial foveae vary in width in about the dorsal half. In both sexes the degree of shagreening of an area may vary slightly from one specimen to another.

Type material. – The holotype female (PHT) was taken at San Luis Lakes, Costilla Co., Colorado, by H. Rodeck, on August 10, 1930. The neallotype male (GEB) (here designated) was taken at Lockerby, San Juan Co., Utah by G. F. Knowlton and W. F. Peay, on August 30, 1942.

Parasites. – None.

Range and localities. – *Andrena ramaleyi* is found in the Great Basin region (map 11). Eleven females and three males were studied. Further collecting may extend the range of this species to Arizona, Idaho, and possibly the Sierra of California. The only altitude record is 2,437 m. All localities from which *A. ramaleyi* has been collected are listed below.

COLORADO. *Costilla Co.:* Fort Garland, San Luis Lakes, San Luis Valley. *Montezuma Co.:* Mesa Verde.

NEVADA. *Lander Co.:* 5 km W. Austin.

NEW MEXICO. *Socorro Co.:* Magdalena

UTAH. *Dagget Co.:* Hideout Corner near Manila, 22 km S. Manila. *San Juan Co.:* Lockerby.

WYOMING. *Sweetwater Co.:* Granger.

Flight records. – Females have been taken from August 9 to August 26, and males from August 4 to August 30.

Floral records. – The meager floral records are for species within the Astereae. A total of 5 females and 1 male visited flowers as follows: 3 females, 1 male, *Chrysothamnus* sp., (P,N); 1 female, *C. nauseosus* (P); 1 female, *Gutierrezia sarothrae* (P).

A. ramaleyi may be separated from other species of the Citrinihirta group by the vestiture, white or nearly white with the wings nearly hyaline, the metasomal terga with abundant vestiture, and the antennae yellow at least ventrally.

Andrena (Cnemidandrena) bendensis Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 19; length, 6.6-7.8 mm; width, 2.1-2.5 mm; wing length, M = 2.21 ± 0.072 mm; FL/FW, M = 1.08 ± 0.104; FOVL/FOVW, M = 3.34 ± 0.304.

Integumental color. – Black except as follows: antenna becoming lighter beyond second flagellar segment to medium brown apically; mandible with apical half red; tegula hyaline light brown, wing veins brown, pterostigma light yellow, wing membrane moderately clouded apically, remainder hyaline; tibial spurs white tinged with yellow; mediotarsi, distitarsi lightly yellowed apically, tarsal claws with basal half yellow, apical half red; metasomal terga with depressed apical margin hyaline; pygidial plate red; sterna widely hyaline apically.

Structure. – Scape equal to flagellar segments 1 to 3; flagellar segment 1 equal to flagellar segment 2; flagellar segment 2 slightly shorter than flagellar segment 3. Eye 4 times longer than wide with inner margin diverging slightly above except for upper end somewhat incurved. Malar space 7 times wider than long. Mandible in repose extends for a little less than one-fourth its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, dorsal surface twice as wide as lateral surface. Maxillary palpus reaching to apex of galea, segmental ratio 0.7 : 0.9 : 0.6 : 0.6 : 0.4 : 0.5. Labial palpus with basal segment laterally compressed and curved, apical segment attached subapically, segmental ratio 1.2 : 0.8 : 0.6 : 0.7. Labral process flat, twice as wide as long, apical emargination small, depth one-fifth length of labral

process. Clypeus strongly protuberant, extending below eyes for slightly less than one-half its length, evenly rounded from side to side; broad, median, lower area nearly impunctate, lateral upper areas with large punctures separated by 1 diameter, punctures becoming smaller near upper periphery, upper periphery narrowly and weakly to moderately shagreened, remainder shiny. Supraclypeal area with medium-sized, irregular punctures obscured by moderate shagreening. Genal area 1.5 times wider than eye, with medium-sized punctures separated by 2 diameters, with weak, reticular shagreening except for narrow, shiny area near eye. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized punctures separated by 1 diameter but somewhat obscured by moderate shagreening. Supra-antennal area with longitudinal rugulae and indistinct, interrugal punctures. Facial fovea nearly 3.5 times longer than wide, rounded above, narrowed and somewhat pointed below, reaching above to a line just above median ocellus, reaching below to a line one-third of distance between antennal fossa and clypeus from antennal fossa.

Pronotum with humeral angle moderately developed; humeral ridge weakly developed, depressed where crossed by pronotal suture; with small, indistinct punctures dorsally; whole area moderately shagreened. Scutum with medium-sized punctures separated by 3 diameters, small dorsal median area shiny, remainder shagreened. Scutellum with anterior two-thirds or more nearly impunctate, shiny, remainder with irregular punctures obscured by moderate shagreening. Metanotum with medium-sized punctures separated by 1 to 2 diameters, densely shagreened. Propodeal enclosure with irregular rugulae in anterior two-thirds, remainder weakly tessellate with a broad, longitudinal, median depression; dorsoposterior areas with medium-sized punctures separated by 1 or more diameters, weakly tessellate; corbicular areas with scattered, medium-sized punctures in anterodorsal third or slightly more, with weak shagreening, nearly shiny. Mesepisternum with medium-sized punctures separated by 1 diameter, except narrow, posterior area nearly impunctate, whole area moderately shagreened. Metepisternum weakly shagreened, nearly shiny. Mesobasitarsus widest medially, slightly less than 2.5 times longer than wide, wider than metabasitarsus. Metabasitarsus widest medially in anterior third, 4 times longer than wide, less than two-thirds width of metatibia. Metatibia cuneate and curved, widest apically, more than 3 times longer than wide; tibial spurs normal. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell less than one-fourth of basal distance of cell from cell apex.

Metasomal terga 1 to 4 with apices of discs with broad bands of medium-sized punctures separated by 1 diameter, tergum 1 with punctures laterally and anteriorly, remaining areas of discs on terga 1 to 4 with small punctures and moderate to light shagreening. Tergum 5 with disc with large punctures separated by less than 1 diameter. Pygidial plate very narrowly rounded apically, sides narrowly raised, narrow, median, longitudinal area moderately raised. Sternum 1 with narrow, V-shaped, median emargination with anterior angle acute, with medium-sized, irregularly spaced punctures, weakly shagreened; sterna 2 to 6 with small punctures separated by 2 to 3 diameters except sterna 3 to 5 with anterior, median, impunctate areas narrowing posteriorly to apical margins, very weakly shagreened, shiny.

Vestiture. – White throughout. Clypeus with broad, median two-thirds naked or nearly so. Scutum with hairs sparse dorsally. Scutellum with anterior, impunctate area naked. Propodeal corbicula with scattered, long, erect hairs in anterodorsal third or slightly more. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with apical fasciae of appressed hairs, fasciae obscuring one-half or slightly less of terga; tergum 1 with fascia less dense than on terga 2 to 4, with long, erect hairs medially anterior to apical fascia, shorters hairs laterally and anteriorly; discs of remaining terga with very sparse, very short, fine hairs. Tergum 5 obscured by long, dense, posteriorly directed hairs. Sternum 1 with well spaced, long, erect hairs medially; sterna 2 to 5 with moderately dense, apical fringes, with subapical fimbriae weak laterally, absent in median thirds; remainder of sternal punctate areas with short, sparse, erect hairs.

MALE. *Measurements and ratios.* – N = 5; length, 5.3-5.9 mm; width, 1.70 mm; wing length, M = 1.84 ± 0.036 mm; FL/FW, M = 1.03 ± 0.067; FS1/FS2, M = 1.23 ± 0.074.

Integumental color. – Black except as follows: antenna light brown beneath beyond second flagellar segment; mandible with apical third red; tegula hyaline dark brown, wing veins medium brown, pterostigma yellow, wing membrane very faintly darkened apically, remainder hyaline; tibial spurs white, tinged lightly with yellow; mediotarsi, distitarsi and tarsal claws as in female; metasomal terga with apical, depressed area hyaline, sterna widely hyaline apically.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 a little longer than fla-

gellar segment 2, equal to flagellar segment 3. Eye 3.3 times longer than wide with inner margin diverging above except for upper end somewhat incurved. Malar space 8 or more times wider than long. Mandible in repose extends for one-third its length beyond middle of labrum with notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea with dorsal surface one-half wider than lateral surface, moderately finely tessellate. Maxillary palpus projecting a little beyond apex of galea; segmental ratio 0.7 : 0.6 : 0.6 : 0.5 : 0.5 : 0.5. Labial palpus as in female except segmental ratio 1.1 : 0.6 : 0.5 : 0.5. Labral process with apical half moderately reflexed, twice as wide as long, apical emargination depth one-third length of labral process. Clypeus moderately protuberant, extending below eyes for a little less than half its length, with large punctures, widely spaced in lower median area, crowded above and laterally, shiny. Supraclypeal area with crowded, medium-sized punctures, shiny. Genal area twice as wide as eye, produced to an angle opposite midpoint of eye with weak, rounded ridge above eye, with small to medium-sized punctures separated by 1 to 2 diameters, about posterior half with light, patchy shagreening, remainder shiny. Vertex, supra-antennal area as in female with paraocular areas as for supra-antennal area.

Pronotum with humeral angle and ridge well developed, humeral angle scarcely depressed where reached by weak, pronotal suture; area above humeral angle strongly shagreened, area below shiny. Remainder of mesosoma as in female except as follows: scutum with dorsal, shiny area larger; lateral area of propodeum with scattered, large punctures in about dorsal half.

Metasomal terga 1 to 5 with medium-sized punctures on discs separated by 1 to 2 or more diameters, surface shiny. Sternum 1 with small, apical, V-shaped emargination with anterior angle acute, with widely spaced, medium-sized punctures; sterna 2 to 6 with small punctures, anteriorly 2 diameters apart but punctures very sparse posteriorly. Sternum 7 (fig. 93) with basal apodemes of equal width throughout, rounded basally; apex truncate with long hairs on lateral angles. Sternum 8 (fig. 94) with apex and neck region equal in length to basal region, apex moderately expanded, neck of equal width throughout with abundant, long hairs. Gonoforceps (figs. 90 to 92) in dorsal view ridged obliquely with weak ridge reaching outer edge, ventrally ridged near apex. Penis valves widest medially, narrowing apically to slightly expanded apex.

Vestiture. – White throughout. Clypeus obscured by moderately dense, long pubescence. Scutum nearly naked dorsally. Metasomal terga 1 to 5 with apical fasciae of short, recumbent hairs, fasciae obscuring a little less than half of terga; fascia of tergum 1 less dense than remaining fasciae; remainder of discs of terga 1 to 5 with erect hairs, long on tergum 1, shorter on tergum 2, shorter still on terga 3 to 5. Sternum 1 with sparse, long, erect hairs, sterna 2 to 5 with well developed, thick, apical fringes, remainder of sternal areas with short, erect, sparse hairs to nearly naked anteriorly.

Variation. – In females the shape of the facial foveae above varies slightly from one individual to another. One female from Purdy, Washoe Co., Nevada, has the clypeus with slightly more than half its length projecting below the eyes. One female and 1 male from Reno, Washoe Co., Nevada, have the pubescence tinged with yellow and the tergal fasciae thicker than other specimens, and the mediotarsal and distitarsal segments are yellow throughout. One male from 24 km S. Headquarters Malheur Refuge, Harney Co., Oregon, has the pro- mediotarsi and distitarsi normal, the meso- mediotarsi and -distitarsi more yellow, and the meta- mediotarsi and -distitarsi light yellow.

Type material. – The holotype female (UCB no 11,132) was taken at 14 km S. Ely, White Pine Co., Nevada, by R. W. Thorp on August 27, 1960. The allotype male (UCB no. 11,132) was taken at Fillmore, Millard Co., Utah, by G. E. Bohart on August 24, 1960. Eighteen female and 4 male paratypes are designated as follows: CALIFORNIA, *Lassen Co.*, 6 km N.W. Standish, 1 female (UCB) B. J. Adelson, September 7, 1957. NEVADA, *Elko Co.*, Carlin, 1 female (UMINN); 1 female, C. E. Michel, August 30, 1939; *Washoe Co.*, Purdy, 1 female (UCB), B. J. Adelson, September 6, 1957, on *Chrysothamnus nauseosus consimilis;* Purdy, 1 female (UCB) E. G. Linsley, September 6, 1957, on *Chrysothamnus* sp.; Reno, 1 female (UCD), F. D. Parker, September 9, 1961; 24 km E. Reno, 1 male (UCD) F. D. Parker, September 9, 1961; Washoe, 1 female (UCD) A. S. Menke, September 8, 1960; 1 female, same data as holotype; 3 females, same data as holotype except collected by J. A. Chemsak. OREGON, *Deschutes Co.*, 32 km S. Bend, 1 female (OSU) Schuh and Grey, August 8, 1939; *Harney Co.*, Headquarters Malheur Wild Life Refuge, 1 female (MSU) R. L. Fischer, August 15, 1962; 1 female, same data, R. F. Hobza, 24 km S. Headquarters Malheur Wild Life Refuge; 1 male (MSU) R. L. Fischer, August 15, 1962. UTAH, 2 females, 2 males, same data as allotype male.

Parasites. – None.

Range and localities. – All collection data are given under "Type material." *A. bendensis* has been taken from only four states, California, Nevada, Oregon, and Utah (map 12), a distribution which suggests that this species is found mainly in the Great Basin region. Altogether, 19 females and 5 males were examined.

Flight records. – Females have been taken from August 8 to September 9, and males have been taken from August 15 to September 9.

Floral records. – *Andrena bendensis* has been taken only from species of *Chrysothamnus.* In all, 3 females are recorded as flower visitors as follows: 1 female, *Chrysothamnus* sp., (P); 1 female, *C. nauseosus consimilis* (P); 1 female, *C. viscidiflorus typicus* (P).

The vestiture is wholly white throughout, a character which separates this species somewhat from the other species within the Citrinihirta group, but the general integumental sculpture and the metasomal vestiture, particularly that on tergum 2, shows that this species lies within the Citrinihirta group.

Andrena (Cnemidandrena) sulcata Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 14; length, 7.3-9.0 mm; width, 2.5-3.1 mm; wing length, M = 3.50 ± 0.116 mm; FL/FW, M = 1.07 ± 0.094; FOVL/FOVW, M = 2.99 ± 0.078.

Integumental color. – Black except as follows: antenna dark brown beneath beyond second flagellar segment; mandible with apical half red; tibial spurs light white-yellow; mediotarsi, distitarsi and basal half of tarsal claws red-yellow, apical half of tarsal claws red; tegula hyaline light yellow-brown; wing veins and pterostigma light yellow; wing membrane with prominent dark spot in marginal area beyond marginal cell, remainder hyaline. Metasomal terga with apical depressed area hyaline. Pygidial plate with apical half dark red, basal half red-yellow. Sterna widely hyaline apically.

Structure. – Scape slightly longer than flagellar segments 1 to 3; flagellar segment 1 slightly shorter than flagellar segments 2 plus 3; flagellar segment 2 shorter than flagellar segment 3. Eye a little less than 4 times longer than wide, with inner margin diverging very slightly above except for upper end somewhat incurved. Malar space 8 times wider than long or slightly less. Mandible in repose extends for one-third its length beyond middle of labrum, with notch of mandible tooth equidistant between middle of labrum and mandible apex; ventrobasal lamella well developed. Galea finely tessellate; dorsal surface nearly one-half wider than lateral surface. Maxillary palpus reaching to apex of galea, segmental ratio 0.9 : 1.1 : 0.7 : 0.7 : 0.6 : 0.6. Labial palpus with basal segment laterally compressed, slightly curved laterally, apical segment attached subapically, subapical segment weakly so; segmental ratio 1.4 : 0.8 : 0.5 : 0.7. Labral process flat, trapezoid, nearly 3 times wider than long, apical emargination very shallow, depth one-sixth or less length of labral process. Clypeus strongly protuberant; extending below eyes for two-fifths its length, with large punctures in median area except separated widely ventromedially leaving a small, impunctate area, punctures smaller, separated by one-half diameter laterally, with upper margin narrowly and lightly shagreened; remainder shiny. Supraclypeal area with medium-sized punctures 1 diameter apart, punctures roughened by moderate shagreening, shagreening reaching to eye. Vertex above lateral ocellus equal to 1 ocellar diameter, with medium-sized, deep punctures separated by 1 diameter, with light shagreening, surface shiny. Supra-antennal area longitudinally rugulate with interruguale with medium-sized punctures. Facial fovea 3 times longer than wide, widest above, narrowing below, reaching above to a line equidistant between antennal fossa and upper margin of clypeus.

Pronotum with humeral angle and ridge weakly developed; humeral ridge crossed by prominent pronotal suture which extends well beyond humeral ridge; pronotum dorsally with medium-sized punctures separated by 1 diameter or less, punctures more widely separated laterally, sparse below pronotal suture, whole area shagreened. Scutum with medium-sized punctures separated by from one-half to 3 diameters, less than anterior half shagreened, remainder very shiny. Scutellum with medium-sized punctures sparse dorsally, closer on extreme posterior margin, dorsal area very shiny, posterior margin shagreened. Metanotum with medium-sized, deep punctures closely spaced except widely spaced on small, median area, with moderate shagreening. Propodeal enclosure with very irregular, prominent rugulae in about anterior half, weak tessellation in posterior half, with median, longitudinal area broadly depressed; dorsoposterior surface with medium-sized punctures separated by 1 diameter or less, dulled by weak tessellation; corbicular areas with medium-sized, widely spaced punctures in less than antero-

dorsal half, surface slightly dulled by light reticular shagreening. Mesepisternum with medium-sized punctures separated by 1 diameter, with moderate shagreening throughout. Metepisternum with very small punctures in upper half, weakly shagreened. Mesobasitarsus widely expanded, widest medially, 2.5 times longer than wide, wider than metabasitarsus. Metabasitarsus widest medially in basal third, dorsal edge nearly straight, less than 3.5 times longer than wide, three-fourths as wide as metatibia. Metatibia cuneate, widest distally, slightly curved ventrally, 3 times longer than wide. Tibial spurs normal. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell one-third or more of distance from apex of cell.

Metasomal terga 2 to 5 with transverse areas posterior to gradulus broadly and deeply depressed below remainder of discs except less so on tergum 1, terga 1 to 4 with discs with medium-sized punctures, separated by 1 to 2 diameters except crowded apically. Tergum 5 with disc with large, deep punctures separated by less than 1 diameter. Terga 1 to 5 shagreened. Pygidial plate pointed apically with edges and median area raised, lateral edges concave; with small, close punctures except small, apical area shagreened. Sternum 1 with small, median, apical, V-shaped emargination medially, with small to medium-sized punctures separated by 2 diameters. Sterna 2 to 5 with transverse areas posterior to gradulus broadly and deeply impressed below remainder of sterna, sterna 2 to 6 with close, medium-sized to large punctures except on hyaline apical area; shagreened throughout.

Vestiture. – White-yellow throughout. Clypeus with broad median area almost naked. Scutum, scutellum, and metanotum well covered with short, light yellow hairs. Propodeal corbicula with sparse, branched hairs in less than anterodorsal half. Trochanteral floccus imperfect.

Metasomal tergum 1 densely covered with long hairs except as follows: hairs erect anteriorly, recumbent posteriorly forming a broad, apical fascia, small lateral patches of short, appressed hairs anterior to apical fascia; terga 2 to 4 with dense, apical fasciae of appressed hairs, fasciae obscuring half of terga; tergum 2 with long, erect hairs on narrow, median, longitudinal area and anteriorly on lateral margin of disc with small area between apical fascia and anterior, erect hairs of short, appressed hairs; remaining areas of terga 2 to 4 with very short, sparse, fine, erect hairs. Tergum 5 with long, white hairs not obscuring surface anteriorly. Sternum 1 with long, sparse, erect hairs medially, sterna 1 to 5 with apical fringes of short, white appressed hairs, very well developed on sternum 1, well developed on sterna 4 and 5, poorly developed on sterna 2 and 3; sterna 2 to 5 with subapical frimbiae not well developed; remainder of sterna 2 to 6 with short, sparse, nearly erect hairs.

MALE. *Measurements and ratios.* – N = 13; length, 5.9-7.0 mm; width, 2.0-2.6 mm; wing length, M = 2.94 ± 0.090 mm; FL/FW, M = 1.06 ± 0.102; FS1/FS2, M = 1.20 ± 0.046.

Integumental color. – Black except as follows: antenna dark brown beneath beyond flagellar segment 1; mandible with a little more than apical third red; tibial spurs white tinged with yellow; tarsi and basal half of tarsal claws yellow, apical half of tarsal claws red; tegula shining brown, wing veins brown-yellow, pterostigma yellow; wing membrane with small, very narrow, marginal area beyond marginal cell very lightly shaded, remainder hyaline; metasomal terga with apical, depressed area hyaline, sterna widely hyaline apically.

Structure. – Scape equal in length to flagellar segments 1 plus 2 plus two-thirds of flagellar segment 3; flagellar segment 1 longer than flagellar segment 2, slightly longer than flagellar segment 3. Eye 3.5 times longer than wide, inner margin moderately diverging above except upper end subparallel or slightly incurved. Malar space, mandible, and galea as in female except mandible without ventro-basal lamella. Maxillary palpus with less than half apical segment projecting beyond apex of galea, segmental ratio 0.6 : 0.7 : 0.5 : 0.5 : 0.6 : 0.5. Labial palpus as in female except segmental ratio 1.1 : 0.5 : 0.4 : 0.6. Labral process trapezoid, weakly reflexed apically, 3 times wider than long, apical emargination depth one-fourth length of labral process. Clypeus strongly protuberant, extending below eyes for two-thirds its length, with large punctures, separated in lower half by 1 diameter, becoming crowded in upper half near upper edge, whole area shiny. Supraclypeal area sculptured as for upper margin of clypeus. Genal area a little less than 1.5 times wider than eye, with large, irregular, close punctures, posterior half shagreened, anterior half shiny. Vertex and supra-antennal areas as in female. Paraocular areas with large, close punctures, surface shiny.

Pronotum with humeral angle and ridge well developed except humeral ridge a little depressed where crossed by prominent pronotal suture; with small punctures dorsally obscured by dense shagreening, small area below pronotal suture smooth, shiny. Remainder of mesosoma as in female except lateral corbicular area of pronotum sculptured as for dorsal surface.

Metasomal terga 1 to 5 as in female except depressed area on terga 2 to 5 more prominent; terga shiny. Sterna 1 to 6 as in female except depressed area more strongly developed, punctures slightly larger, deeper, with light shagreening. Sternum 7 (fig. 98) with basal apodemes narrowing anteriorly; apex pointed with long hairs laterally. Sternum 8 (fig. 99) with apex and neck region a little longer than basal region, apex scarcely expanded, neck narrow with abundant, long hair. Gonoforceps (figs. 95 to 97) in dorsal view with inner ridge not produced to outer edge; in ventral and lateral view with a small inner ridge near apex. Penis valves in dorsal and ventral view slightly expanded medially, median width equal to basal width; in lateral view downturned apically, as long as gonoforceps.

Vestiture. – White-yellow throughout. Clypeus with dense pubescence obscuring surface. Mesosoma dorsally as in female. Metasomal terga 1 to 5 with well-developed, apical fasciae obscuring more than half terga. Tergum 1 with long, erect hairs on remaining area, tergum 2 similar, hairs longest medially but shorter than median, erect hairs on tergum 1. Terga 3 to 5 with discs with short, erect hairs throughout, hairs shortest medially. Sternum 1 with sparse, long, erect hairs throughout, sterna 2 to 5 with strongly developed, apical fringes, remaining areas of sterna 2 to 6 with sparse, erect hairs.

Variation. – The propodeal enclosure varies in the degree of expression of the median longitudinal depression. In the holotype female from Ritzville, Adams Co., Washington, the depression is well developed with a carina anteriorly. One female from Wenatchee, Chelan Co., Washington, also has a short carina as in the female holotype, but another female from the same locality has a carina but the depression poorly developed, and another female from the same locality has the carina absent and the depression almost absent. The hair patterns on terga 1 and 2 are very similar in all female specimens, but the development of the tergal and sternal depressions varies somewhat.

In males the sculpturing of the propodeal enclosure varies less than in females, but one male from Burntfork, Sweetwater Co., Wyoming, has the propodeal enclosure irregularly rugulate almost throughout and no obvious, median, longitudinal depression.

Type material. – The holotype female (NMNH no. 71,075) was collected at Ritzville, Adams Co., Washington, by R. C. Shannon on September 9, 1920. The allotype male (KU) was taken at Devils Slide, Summit Co., Utah, by G. F. Knowlton on August 24, 1962. Thirteen female and 12 male paratypes are designated as follows: NORTH DAKOTA, *Billings Co.,* Medora, 1 female (NDSU), September 21, 1917. OREGON, *Malheur Co.,* Adrian, 1 female (GEB), P. F. Torchio, September 8, 1959; *Umatilla Co.,* 9 km E. Hermiston, 2 females (GEB), P. F. Torchio. UTAH, *Cache Co.,* Cornish, 1 female (GEB), August 9, 1959, on *Chrysothamnus* sp.; *Morgan Co.,* Morgan, 6 males (KU), G. F. Knowlton, August 24, 1962; 1 female and 5 males, same data as allotype; *Wasatch Co.,* Heber, 1 female, (GEB), G. E. Bohart, September 15, 1958. WASHINGTON, *Chelan Co.,* Wenatchee, 4 females (MSU), J. Standish, September 25, 1938. WYOMING, *Sweetwater Co.,* Burntfork, 1 female, 1 male, (KU), G. F. Knowlton, on *Chrysothamnus* sp.; *Uinta Co.,* 16 km E. Evanston, 1 female (UCD), A. T. McClay, August 18, 1951.

Parasites. – None.

Range and localities. – All collection data are given under "Type material." *A. sulcata* has been taken only from the northwestern area of the United States; the states of North Dakota, Oregon, Utah (northern), Washington, and Wyoming (southern) (map 12). Further collecting will probably show this species to be present in Idaho and Montana. In all, 14 females and 13 males were examined.

Flight records. – Females have been taken from August 9 to September 25, and males were taken on August 24.

Floral records. – There are floral records for 3 specimens; 2 females, 1 male, *Chrysothamnus* sp., (P,N).

The vestiture is light yellow throughout, and the vestiture of the metasoma, particularly that of tergum 2, places this species within the Citrinihirta group. However, the species is readily distinguished from all other *Cnemidandrena* by the deep, transverse depression posterior to the gradulus on metasomal terga 2 to 5.

Andrena (Cnemidandrena) hirticincta Provancher

Andrena fimbriata Smith, 1853, Cat. Hymenop. Br. Mus. 1:116 male, female (preoccupied); Morice and Cockerell, 1901, Can. Entomol. 33:149 (type of *fimbriata*); Cockerell, 1906, Psyche 13:9 (type).

Andrena hirticincta Provancher, 1888, Addit. Corr. Faune Entomol. Canada Hymenop. 308 female, male (new name); Cockerell, 1906, Trans. Am. Entomol. Soc. 32:296 (record); Viereck, 1907, Entomol. News 18:286 (key); Salt, 1927, J. Exp. Zool. 48:233 (Stylopization); Cockerell, 1931, Am. Mus. Novit. 458:11, 14, 15, (record, key); Atwood, 1934, Can. J. Res. 10(2):207, 209, female, male (key); Brittain and Newton, 1934, Can. J. Res. 10:261 (flower records); Cockerell, 1937, Can. Entomol. 69:35 (record); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1067.

Anthrena americana Dalla Torre, 1896, Cat. Hymenop. 10:102 (new name).

Andrena (Cnemidandrena) hirticincta, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Mitchell, 1960, N.C. Agric. Exp. Stn. Tech. Bull. 141, 1:173-174 (description, distribution); Krombein, 1967, U.S. Dep. Agric. Agric. Monogr. 2, suppl. 2:430 (distribution, flower records).

FEMALE. *Measurements and ratios.* – N = 20, length, 11.0-13.1 mm; width, 3.4-4.4 mm; wing length, M = 3.54 ± 0.184 mm; FL/FW, M = 0.96 ± 0.088; FOVL/FOVW, M = 2.55 ± 0.064.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond second flagellar segment, apical half of mandible red; tegula brown-yellow; wing veins red-brown; wing membrane hyaline except for apical area moderately darkened; tarsi, except basitarsi, light yellow-brown; tibial spurs light yellow; metasomal terga and sterna narrowly hyaline apically.

Structure. – Flagellar segments 1 to 3 equal in length to scape, flagellar segment 1 longer than flagellar segments 2 plus 3; flagellar segments 2 and 3 each shorter than succeeding segments. Eye more than 4 times as long as broad, with inner margin diverging very slightly above except for upper end incurved. Malar space short, more than 7.5 times wider than long. Mandible in repose extends for one-fourth its length beyond middle of labrum; notch of mandible tooth almost equidistant between middle of labrum and mandible apex. Galea moderately tessellate, lateral surface as broad as dorsal surface. Maxillary palpus projecting slightly beyond apex of galea, segmental ratio 0.9 : 0.9 : 0.8 : 0.8 : 0.6 : 0.7. Labial palpal segment 1 compressed laterally, curved basally, apical segment attached subapically, segmental ratio 1.5 : 0.7 : 0.4 : 0.6. Labral process more than twice as broad as long, apical emargination depth one-fourth length of labral process, apical third slightly reflexed. Clypeus slightly protuberant, extending below eyes for one-third its length; lower two-thirds with large, irregular punctures, except for narrow median area impunctate; whole surface shagreened. Supraclypeal area shagreened. Genal area twice as wide as eye with fine, irregular shagreening, surface shiny. Vertex above lateral ocellus less than 1.5 ocellar diameters with irregular shagreening. Face above antenna with longitudinal rugulae extending to just above lateral ocellus. Facial fovea 2.5 times as long as broad, wide above, narrowing below, extending dorsally to a line through middle of median ocellus, below to just below antennal fossa.

Pronotum with humeral angle moderately developed, humeral ridge weak, and absent where reached by pronotal suture; pronotum dorsally with fine, reticular shagreening; vertical rugulae above pronotal suture, reticular shagreening below. Remainder of mesosoma dorsally coarsely tessellate, dull, punctures prominent except on scutum and propodeal enclosure. Propodeal enclosure well defined, with a broad, longitudinal depression medially, irregular, longitudinal rugulae in anterior third. Mesepisternum moderately tessellate above, shagreened below with scattered prominent punctures; metepisternum shagreened, with punctures on dorsal posterior area. Mesobasitarsus strongly expanded medially, length less than 3 times width, narrower than metabasitarsus. Metabasitarsus strongly expanded basally, narrowed distally, nearly 3 times as long as broad. Wing with pterostigma linear, length 4 times width, vein 1st m-cu meets second submarginal cell slightly beyond middle.

Metasomal terga 1 to 5 moderately tessellate, dull in direct view; punctures on discs of terga 1 to 4 separated by 2 to 5 diameters, becoming closer on posterior margins of discs; anterior rim of punctures raised. Disc of tergum 5 with very large, deep punctures, crowded on posterior margin, anterior rim of punctures strongly thickened and raised. Pygidial plate V-shaped, anterior half with fine, closely set punctures, posterior half impunctate, lateral edges raised. Sterna shagreened, punctures smaller than those on terga; sternum 1 emarginate medially.

Vestiture. – That of head, mesosoma, and metasomal terga 1 to 4 green-yellow. Tergal discs 1 to 4 with abundant erect hairs, long on tergum 1, shorter on posterior terga, becoming progressively recumbent apically, forming broad fasciae as wide as more exposed areas. Hairs of profemur and long, recurved hairs of trochanteral floccus white; remaining leg hairs white or brown-black to tibia, black beyond tibia. Terga 5 and 6 with dense, black, appressed hairs obscuring whole surface. Sternum 1 with long, black, erect hairs on median third; sterna 2 to 6 with short, white, thinly scattered hairs basally,

long black hairs laterally forming subapical fimbriae; apical margins of sterna 2 to 5 with narrow apical fringes of short, white, appressed hairs.

MALE. *Measurements and ratios.* – N = 20; length, 8.5-10.1 mm; width, 2.3-3.1 mm; wing length, M = 2.80 ± 0.176 mm; FL/FW, M = 0.94 ± 0.086; FS1/FS2, M = 1.44 ± 0.114.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond 1st flagellar segment; mandible red in apical third; tegula and wing as in female; legs black or nearly black, tibial spurs light yellow. Metasomal terga and sterna black or nearly red-brown; tergal and sternal apical margins moderately widely hyaline.

Structure. – Scape shorter than flagellar segment 1 to 3; twice as long as flagellar segment 1; flagellar segment 1 longer than flagellar segments 2 or 3. Eye more than 3 times as long as broad, inner margin diverging slightly above except for upper end incurved. Malar space 9 times wider than long. Mandible, galea as in female. Maxillary palpus projecting slightly beyond apex of galea, segmental ratio 0.6 : 0.8 : 0.6 : 0.6 : 0.7 : 0.6. Labial palpus as in female except basal segment less compressed laterally, segmental ratio 1.1 : 0.5 : 0.4 : 0.5. Labral process very strongly reflexed, half as long as broad, median emargination depth one-third length of reflexed area. Clypeus flat, extending less than half its length below eyes; dorsolateral margins with small punctures obscured by shagreening, remainder with large, irregular, close punctures. Supraclypeal area as in female. Supra-antennal area irregularly rugose with scattered, obscure punctures. Paraocular area below antennal fossa with large punctures separated by 1 diameter, above antennal fossa with longitudinal rugulae obscuring scattered punctures. Vertex as in female. Genal area twice as wide as eye with fine, irregular shagreening, posterior median margin produced to a distinct angle.

Pronotum with humeral angle and ridge well developed; pronotum irregularly shagreened dorsally, longitudinally rugose laterally nearly obscuring pronotal suture; angle between pronotal ridge and pronotal lobe smooth, polished. Remainder of mesosoma sculptured as in female except as follows: scutellum shiny on anterior half; propodeal enclosure flat medially, propodeal lateral areas moderately tessellate; metepisternum finely tessellate dorsally.

Metasomal terga sculptured as in female but punctures smaller, apical margins more widely hyaline. Sterna as in female except for sternum 1 broadly emarginate apically, sternum 2 less so. Sternum 7 (fig. 103) with posterior median notch, short hairs apically. Sternum 8 (fig. 104) with apex truncate, hairs abundant on neck region but few on anterior basal area. Gonoforceps (figs. 100 to 102) in dorsal view obliquely flattened and expanded, hairs on apical two-thirds only; penis valves strongly expanded laterally to blunt processes, penis valve apices expanded, lobelike.

Vestiture. – Green-yellow except for brown to black hairs on tibiae and basitarsi. Hair on clypeus more dense than in female. Metasomal terga as in female but fasciae less dense. Sterna with suberect, subapical fimbriae with hairs longest laterally on sterna 2 to 4.

Variation. – In both sexes a very few hairs on the extreme lateral margins of tergum 4 may be light brown. The propodeal enclosure can be flat. In males, black hairs may be present on all femora, tibiae and tarsi, or brown hairs only may be present on the metatibiae and metatarsi. The posterior median margin of the gena may vary from rounded to produced to a distinct projection. Bilateral variation can occur in the same specimen.

Type material. – The holotype female and allotype male (BMNH) were collected in the United States by E. Doubleday (no date given).

Parasites. – The following 12 females and 6 males each carry 1 female stylops in their abdomens: MINNESOTA, *Carver Co.*, Zumbra Heights, 1 female. NEW YORK, McLean Bogs Reserve, 1 male. NORTH DAKOTA, *Barnes Co.*, Valley Cit, 5 females; *Cass Co.*, Fargo, 1 male; *Morton Co.*, Mandan, 1 female. ONTARIO, Bobcaygeon, 1 female; Lindsay, 1 female. PENNSYLVANIA, *Monroe Co.*, Pocono Pines, 1 male. PRINCE EDWARD ISLAND, Brimley, 1 female. QUEBEC, Montreal, 1 female, 3 males. SOUTH DAKOTA, *Brookings Co.*, Brookings, 1 female. VERMONT, *Washington Co.*, E. Montpelier, 1 male.

Range and localities. – This species is one of the most widely distributed North American *Cnemidandrena*, ranging in the east from Prince Edward Island south to North Carolina, west to New Mexico and north to Alberta (map 13). Altogether, 439 females and 260 males were examined.

ALBERTA. Lethbridge, Medicine Hat.

COLORADO. Peacapp Valley. *Boulder Co.:* Ward. *El Paso Co.:* Colorado Springs, Manitou Park. *Jackson Co.:* Medicine Bow Mountains. *Jefferson Co.:* Golden Lookout Mountain. *Larimer Co.:* Pingree Park.

CONNECTICUT. *Fairfield Co.:* Candlewood Lake, New Canaan, Stamford. *Hartford Co.:* Hartford. *Litchfield Co.:* Bethlehem, Colebrook. *New Haven Co.:* New Haven, West Rock Park. *Tolland Co.:* Storres.

IDAHO. *Bannock Co.:* Downey. *Bingham Co.:* Fort Hall.

ILLINOIS. *Cook Co.:* Berwyn, Palos, Riverside Woods. *Lake Co.:* Volo Tamarack Bog. *La Salle Co.:* Fort Sheridan. *McHenry Co.:* Algonquin.

INDIANA.

IOWA.

MAINE. Staceyville, Camp Lunksoos. *Franklin Co.:* Dryden. *Kennebec Co.:* Monmouth. *Lincoln Co.:* Waldoboro. *Penobscot Co.:* Orono. *Somerset Co.: Waldo Co.:* Belfast. *York Co.:* Chase's Lake, Ogunquit, Saco.

MANITOBA. Aweme.

MARYLAND. *Montgomery Co.:* Bethesda, Cabin John, Glen Echo. *Prince Georges Co.:* Bladensburg.

MASSACHUSETTS. Forest Hills. *Barnstable Co.:* Barnstable, Dennis, Princeton, Woods Hole. *Dukes Co.:* Martha's Vineyard. *Essex Co.:* Beach Bluff, Nahant, North Saugus. *Franklin Co.:* Riverside. *Hampshire Co.:* Amherst. *Middlesex Co.:* Brookline, Framingham, Natick, North Bedford, Reading Highlands, Sherborn. *Norfolk Co.:* Boston, Needham.

MICHIGAN. *Charlevoix Co.; Cheboygan Co.:* Douglas Lake, Williams Corner. *Leelanau Co.; Midland Co.; Van Buren Co.:* 5 km N. Decatur.

MINNESOTA. *Beltrami Co.:* Cass Lake. *Big Stone Co.:* Ortonville. *Brown Co.:* Sleepy Eye. *Carver Co.:* Zumbra Heights. *Cass Co.:* Woman Lake, Hacken Sack. *Chisago Co.:* Chisago City. *Dakota Co.:* Hastings. *Lincoln Co.:* Lake Benton. *Norman Co.; Olmsted Co.:* Rochester. *Ramsey Co.:* University Farm. *Wabasha Co.:* Lake City. *Yellow Medicine Co.*

MONTANA. *Cascade Co.; Gallatin Co.:* Three Forks.

NEBRASKA. *Dawes Co.:* Crawford. *Lancaster Co.:* Lincoln. *Sioux Co.:* Glen.

NEW BRUNSWICK. Birch Cave near Chamcook, Fredericton, Greys Mills.

NEW HAMPSHIRE. *Belknap Co.:* Meredith. *Cheshire Co.:* Jaffray, Nelson. *Coos Co.:* Jefferson, Lancaster. *Grafton Co.:* Franconia, Littleton. *Hillsboro Co.:* Pelham. *Rockingham Co.:* Hampton. *Strafford Co.:* Durham.

NEW JERSEY. *Bergen Co.:* Englewood, Fort Lee, Ramsey. *Union Co.:* Westfield.

NEW MEXICO. *Guadalupe Co.:* San Ignacio.

NEW YORK. Beaver Brook, McLean Reserve, Grass Bog 3 McLean Reserve, McLean Bogs Reserve. *Cattaraugus Co.:* Otto. *Cayuga Co.:* N. Fairhaven. *Erie Co.:* East Aurora, Gowanda, Hamburg. *Franklin Co.:* Fish Creek Pond, Tupperlake. *Jefferson Co.:* Grand Island. *Nassau Co.:* Lynbrook. *New York Co.:* Central Park, New York, New York City Vicinity. *Seneca Co.:* Covert. *Putnam Co.:* Garrison. *Suffolk Co.:* Amagansett, Babylon, East Hampton, Long Island, Montauk, Napeague, Orient, Riverhead, Sea Cliff. *Tompkins Co.:* Ithaca. *Westchester Co.:* Lewisboro.

NORTH CAROLINA. *Avery Co.:* Grandfather Mountain, Linville. *Buncombe Co.:* Valley of Black Mountains. *Transylvania Co.:* Mt. Pisgah, *Yancey Co.:* Mt. Mitchell.

NORTH DAKOTA. *Barnes Co.:* Valley City. *Billings Co.:* Medora. *Cass Co.:* Fargo. *Grand Forks Co.:* Grand Forks, 21 km N.W. Inkster. *Hettinger Co.:* Mott. *McKenzie Co.:* Schafer. *Morton Co.:* 16 km E. Glenn Ullin, Mandan. *Pierce Co.:* Rugby. *Richland Co.:* 18 km W. Walcott, 43 km N. Wyndmere. *Stutsman Co.:* Jamestown. *Williams Co.:* Williston.

NOVA SCOTIA. Bear River, Ingonish Cape Breton Highlands, Truro.

ONTARIO. Bobcaygeon, Brimley, Dunnville, Effingham, Grand Bend, Hillcrest, Lindsay, Mamora, Merivale, Normandal, Ottawa Uplands Sand Pits, Perth Road, Port Dooly, Toronto.

PENNSYLVANIA. Colton Point Street Park. *Allegheny Co.:* Pittsburgh, Sample Station, West View. *Beaver Co.:* New Galilee. *Delaware Co.:* 8 km S. Bryn Mawr, Ingram, *Erie Co.:* Erie. *Forest Co.:* Lynch. *Mercer Co.:* Sandy Lake. *Monroe Co.:* Pocono Pines. *Montgomery Co.*

PRINCE EDWARD ISLAND. Brimley, Dalvay House Canada National Park, Prince Edward Island National Park.

QUEBEC. Aylmer, Beach Grove, Ft. Coulonge, Ile Jesus 6 km N. Montreal, La Trappe, Mont Joli, Montreal, Notre Dame du Portage, Trois Rivieres.

RHODE ISLAND. *Providence Co.:* North Scituate.

SASKATCHEWAN. Earl Grey, Rutland, Val Marie, White Fox.

SOUTH DAKOTA. *Brookings Co.:* Brookings. *Custer Co.:* Custer. *Kingsbury Co.:* Lake Preston.

UTAH. *Cache Co.:* Logan Canyon.

VERMONT. *Washington Co.:* East Montpelier.

VIRGINIA. Mountain Lake, Rosecourt, Skyland. *Augusta Co.:* Big Bald Knob. *Arlington Co.:* Kearney. *Fairfax Co.:* Arlington.

WASHINGTON, D.C.

WISCONSIN. Hunts Junction, Morris, Salmo. *Bayfield Co.; Dane Co.:* Madison, University Arboretum Madison. *Jefferson Co.:* 6 km N. Lake Mills. *Kenosha Co.:* Kenosha. *Milwaukee Co.:* Milwaukee. *Outagamie Co.:* Leeman. *Richland Co.:* 8 km S. Lone Rock. *Vilas Co.:* Tenderfoot Lake, Trout Lake.

WYOMING. *Albany Co.; Big Horn Co.:* Big Horn Station. *Converse Co.:* 8 km S. Douglas, 16 km S. Douglas. *Sheridan Co.:* Mountains near Sheridan.

Flight records. – Females have been taken from May 1 to October 12, and males from May 21 to October 3. About 98 percent of all records are in August and September.

Floral records. – *A. hirticincta* takes pollen primarily from species of *Solidago.* The list below includes published records: 5 females, 3 males, *Aster* sp., (P,N); 1 female, *A. ericoides* (P,N); 4 females, *A. paniculatus* (P,N); 1 male, *Epilobium* sp.; 1 male, *Eupatorium perfoliatium;* 5 females, *Euthamia graminifolia* (P,N); 2 females, *Grindelia* sp., (P,N); 4 females, 3 males, *G. squarrosa* (P,N); 1 male, *Gutierrezia sarothrae;* 33 females, 23 males *Solidago* sp., (P,N); 6 females, *S. altissima* (P,N); 11 females, *S. canadensis* (P,N); 1 female, *S. mollis* (P,N); 2 females, *S. nemoralis* (P,N); 4 females, *S. rugosa* (P,N); 1 female, *S. vadula* (N).

This species is differentiated from other *Cnemidandrena* by the green-yellow tinge of most of its pubescence. The pointed lateral expansions of the penis valves in the male closely associate this species with *A. colletina,* but the general appearance of the pubescence of *A. colletina* is light yellow on the mesosoma and white on the metasoma. *Andrena hirticincta* is more distantly related to *A. surda* and *A. luteihirta,* the males of which have somewhat rounded lateral expansions of the penis valves, but the overall vestiture of these two species is yellow.

Andrena (Cnemidandrena) colletina Cockerell

Andrena colletina Cockerell, 1906, Am. Mus. Nat. Hist. Bull. 22:454, male; 1909, Ann. Mag. Nat. Hist. Bull. (8) 5:260, female (taxonomy); 1931, Am. Mus. Novit. 458:14, 15, female, male (key); 1934, Am. Mus. Novit. 697:2 (record); Buckell, 1949, Proc. Entomol. Soc. B. C. 45:28 (record); Krombein, 1958, U.S. Dep. Agric. Agric. Monogr. 2, suppl. 1:213 (record).

Andrena (Cnemidandrena) colletina, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric Agric. Monogr. 2:1062.

FEMALE. *Measurements and ratios.* – N = 20; length, 11.5-14.5 mm; width, 3.5-5.0 mm; wing length, M = 3.79 ± 0.446 mm; FL/FW, M = 0.98 ± 0.235; FOVL/FOVW, M = 2.44 ± 0.136.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond second flagellar segment; apical half of mandible dark red; tegula shining light brown; wing membrane very slightly darkened apically; wing veins red-brown; tarsal segments except basitarsi yellow; tibial spurs pale yellow; metasomal terga widely hyaline apically; sterna more narrowly hyaline apically; basal half of pygidium red-black.

Structure. – Flagellar segments 1 to 3 equal in length to scape, flagellar segments 2 plus 3 slightly shorter than flagellar segment 1, flagellar segment 2 slightly shorter than flagellar segment 3. Eye almost 3.5 times as long as broad, with inner margin diverging slightly above except upper end incurved. Malar space short, 6 times as wide as long. Mandible in repose extends one-third its length beyond middle of labrum; notch of mandible tooth one-sixth length of mandible from mandible apex. Galea moderately tessellate, lateral surface two-thirds as broad as dorsal surface. Maxillary palpus reaching to apex of galea, segmental ratio 1.3 : 1.4 : 1.0 : 0.9 : 0.8 : 0.8. Labial palpal basal segment moderately compressed laterally, curved throughout, segmental ratio 1.9 : 0.8 : 0.5 : 0.7. Labral process prominent, flat, half as long as broad, with median emargination depth one-fourth length of labral process. Clypeus extending for half its length beyond lower level of eyes, slightly protuberant, with round, coarse, irregularly spaced punctures in lower half; punctures decreasing in size toward dorsal and lateral periphery; whole surface moderately shagreened with shagreening more dense dorsolaterally. Supraclypeal

area moderately shagreened; supra-antennal area with longitudinal rugulae and indistinct, medium-sized interrugal punctures. Genal area 1.5 times as wide as eye, with fine, reticular shagreening, except narrow area near eye shiny. Vertex above lateral ocellus equals 1.5 ocellar diameters, with medium-sized punctures separated by 1 diameter, moderately tessellate. Facial fovea slightly longer than half length of eye, more than twice as long as broad, rounded above, narrowed below, not extending below level of antennal fossa, reaching above to a line above median ocellus.

Pronotum with humeral angle and ridge moderately developed, pronotal suture prominent, extending well beyond humeral ridge, with moderate tessellation, punctures obscure. Rest of mesosoma dorsally with coarse, dense tessellation. Propodeal enclosure with longitudinal rugulae medially in anterior half, dorsal and posterior surfaces of propodeum with prominent punctures, lateral, corbicular surfaces with medium-sized, widely spaced punctures in anterior third, with light, reticular shagreening, shiny. Mesepisternum with medium-sized punctures separated by 3 diameters, weakly tessellate. Metepisternum with light, nearly reticular shagreening, moderately shiny. Mesobasitarsus widest medially, nearly 3 times longer than wide, slightly narrower than metabasitarsus. Metabasitarsus widest in basal third, 3 times longer than wide, narrower than metatibia. Metatibia somewhat cuneate, widest basally, narrowing distally, more than 3 times as long as broad. Pterostigma linear, 4.5 times as long as broad, vein 1st m-cu meets second submarginal cell a little beyond middle.

Metasomal terga 1 to 4 with discs with medium-sized punctures separated by 2 diameters, closer on posterior margins of discs, moderately tessellate. Tergum 5 with nearly large punctures, punctures tilted toward posterior, anterior rim raised and thickened; weakly tessellate. Pygidial plate broad basally, V-shaped with apex blunted, lateral edges raised, anterior half with small, close punctures, posterior half impunctate. Sternum 1 with small, median, V-shaped, apical emargination, and medium-sized punctures separated by 2 diameters. Sterna 2 to 6 with small punctures separated by 1 diameter or slightly more. Sterna 1 to 6 lightly shagreened, surface nearly shiny.

Vestiture. – Head hairs yellow, facial foveal hairs pale yellow. Thoracic hairs yellow above, white laterally and below; propodeal corbicula with long, plumose, widely spaced hairs in anterior third. Leg hairs yellow to white except as follows: brown to black hairs distally on metafemora and ventral distal edges of pro- and mesotibiae; brown dorsal and pale ventral hairs of scopa, and brown to black hairs of basitarsi. Metasomal terga 1 to 4 with broad, white fasciae as wide as exposed areas; tergum 1 with long, dense, white, nearly vertical hairs throughout, except more prostrate posteriorly, forming a dense fascia. Terga 2 and 3 with scattered, white, appressed hairs on median thirds of discs; apical fasciae appressed; remainder of basal areas with scattered, erect, short, brown to black hairs, becoming more dense laterally. Tergum 4 similar but without white hairs on median third of basal area. Tergum 5 with dense, black, appressed hairs apically, erect, long, black hairs on basal area. Sternum 1 with median longitudinal tuft of hairs, white and erect anteriorly, brown to black and appressed posteriorly. Sterna 1 to 5 with apical fringes well developed, sterna 2 to 5 with subapical fimbriae well developed laterally, poorly developed in narrow median areas, hairs white to black; sterna 2 to 6 with remaining areas having nearly erect brown to black hairs.

MALE. *Measurements and ratios.* – N = 20; length, 10.0-12.5 mm; width, 2.6-4.0 mm; wing length, M = 3.38 ± 0.178 mm; FL/FW, M = 0.98 ± 0.068; FS1/FS2, M = 1.38 ± 0.412.

Integumental color. – Color as in female except as follows: antenna red-brown ventrally beyond 1st flagellar segment, mandible with a little more than apical third red, tarsi red-yellow, wing very lightly clouded apically.

Structure. – Scape shorter than flagellar segments 1 to 3; flagellar segment 1 longer than flagellar segments 2 or 3, flagellar segment 2 longer than flagellar segment 3. Eye 3 times as long as broad, inner margin diverging slightly above except for upper end slightly incurved. Malar space 8.5 times as wide as long; mandible in repose extends one-eighth of its length beyond middle of labrum, notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea as in female. Maxillary palpus reaching slightly beyond apex of galea, segmental ratio 1.0 : 1.1 : 0.9 : 0.9 : 0.8 : 0.9. Labial palpus as in female except segmental ratio 1.5 : 0.7 : 0.6 : 0.9. Labral process strongly reflexed, half as long as broad, median emargination more than one-third as deep as labral process is long. Clypeus almost flat, extending for one-fourth its length below eyes; sculpture as in female. Gena, vertex and supraclypeal areas as in female except gena weakly angulate opposite midpoint of eye. Paraocular areas with weak, longitudinal rugulae and medium-sized interrugal punctures.

Pronotum with humeral angle and ridge well developed, except humeral ridge broadly and shallowly

depressed where crossed by pronotal suture. Sculpturing of mesosoma as in female except as follows: pronotum irregularly rugose dorsally, laterally with vertical rugulae except angle between ridge and posterior lobe polished; propodeal enclosure obliquely rugose laterally; lateral areas of propodeum weakly tessellate.

Metasomal terga sculptured as in female but punctures obscure, surfaces shinier. Sterna 2 to 5 with slight median emarginations; sterna 1 to 6 sculptured as in female. Sternum 7 (fig. 108) with basal apodemes narrowing slightly posteriorly, short, sparse hairs apically with row of short, fine hairs across basal apodeme anteriorly. Sternum 8 (fig. 109) with apex and neck region equal in length to basal region; neck region with abundant, long hairs, apex hyaline. Gonoforceps (figs. 105 to 107) in dorsal view obliquely flattened and expanded; penis valves strongly expanded laterally to slightly pointed processes, apices expanded, lobelike.

Vestiture. – Head and mesosoma color as in female; facial hair more dense than in female. Metasomal terga 2 to 5 with prominent, white, appressed apical fasciae obscuring about half dorsal areas. Tergum 1 with whole surface obscured by long, erect, white hairs, forming a weak fascia apically; discs of remaining terga with erect, short hairs, white on tergum 2, becoming darker on each posterior tergum to brown-black on tergum 6; sternal vestiture as in female except apical fringes strongly developed on sterna 2 to 4.

Variation. – All males from California and Oregon, one male from Kaibab Forest, Coconino Co., Arizona, and two males from Nebraska, Lancaster Co., and Glenn, Sioux Co., are without black hairs on the posterior metasomal terga; the discal hairs are concolorous with the apical fasciae except for a very slight browning of some discal hairs are concolorous with the apical fasciae except for a very slight browning of some discal hairs on tergum 5. These males have the tarsi, except basitarsi, light yellow, One male from Kaibab Forest, Coconino Co., Arizona, has two submarginal cells in the right wing. Buckell (1949) records two females collected at Chilcotin, British Columbia, on April 16, 1921. This collection date is anomalous for *A. colletina,* and suggests that these two specimens are incorrectly identified. I have not seen the specimens, but doubting their identification, have excluded these data from the records for this species.

Type material. – The holotype male (PHT) was taken at Florissant, Teller Co., Colorado, on August 30 (no year given) by S. A. Rohrer, on *Senecio* sp. The neallotype female (PHT) (here designated) was taken at San Luis Lakes, Costilla Co., Colorado, on August 10, 1930, by H. Rodeck.

Parasites. – One male from Wolf Creek Pass, Mineral Co., Colorado, carries two triungulins.

Range and localities. – This species is known from Oregon and California south to New Mexico, east to Nebraska and north to North Dakota and southern Saskatchewan (map 14). Altitude records are 1,250 m, 1,468 m, 1,500 m, and 2,500 m. Totals of 74 females and 142 males have been examined, and the localities given below include those for specimens examined and published records.

ARIZONA. *Coconino Co.:* Flagstaff, Ft. Valley near Ex Fort Headquarters, Kaibab Forest.

CALIFORNIA. *Lassen Co.:* 8 km S. Doyle, 11 km N.W. Milford, 6 km S. Ravendale, 3 km W. Standish. *Modoc Co.:* Newell. *Mono Co.:* Bridgeport, Mammoth. *Plumas Co.:* 13 km N.W. Chester. *Shasta Co.:* Mt. Lassen National Park, 8 km S.W. Old Station. *Sierra Co.:* 11 km N.W. Sierraville. *Siskiyou Co.:* Gazelle, Lower Klamath Lake, Macdoel, 14 km S. Mt. Hebron.

COLORADO. *Costilla Co.:* San Luis Lakes. *Dolores Co.:* 10 km W. Dove Creek. *Huerfano Co.:* Gardner. *El Paso Co.:* Manitou Park. *Garfield Co.:* 19 km N. Rifle. *Jackson Co.:* Medicine Bow Mts., Rand, Walden. *Mineral Co.:* Wolf Creek Pass. *Moffat Co.:* 16 km S. Mt. Hamilton. *Saquache Co.:* Saquache.

NEBRASKA. *Lancaster Co.:* Lincoln. *Sioux Co.:* Glen, Monroe Canon.

NEW MEXICO. *Bernalillo Co.:* Fort Garland. *Catron Co.:* Quemado, Reserve. *McKinley Co.:* McGaffrey. *Rioarriba Co.:* Lybrook.

NORTH DAKOTA. *Billings Co.:* Medora, Theo. Roos. Memorial Park.

OREGON. *Deschutes Co.:* 32 km S. Bend. *Harney Co.:* 24 km S. Headquarters, Malheur Refuge. *Klamath Co.:* Chemult, 11 km N. of East Entrance to Crater Lake Park, 27 km E. Klamath Falls, Modoc Point, Sand Creek. *Lake Co.:* Lakeview. *Umatilla Co.:* 10 km E. Hermiston.

SASKATCHEWAN. Eastend.

UTAH. *Beaver Co.:* Beaver. *Dagget Co.:* Hideout Corner near Manila, Manila, 23 km S. Manila. *Duchesne Co.:* Monarch. *Millard Co.:* Deseret, Pahvant. *San Juan Co.:* La Sal, Lockerby, Monticello.

WYOMING. *Albany Co.; Converse Co.:* 16 km S. Douglas. *Fremont Co.:* 21 km S.W. Dubois. *Sublette Co.:* 13 km W. Pinedale. *Sweetwater Co.:* Granger. *Uinta Co.:* 3 km S.W. Evanston.

Flight records. – Females of *A. colletina* have been taken from August 3 to October 20, and males from July 30 to September 28; all other records are for August and September.

Floral records. – Females of this species collect pollen from species within the Astereae. Floral records for 27 females and 27 males are as follows: 8 females, *Aster* sp., (P,N); 4 females, 13 males, *Chrysothamnus* sp., (P,N); 2 females, *C. graveolens,* (P,N); 5 females, 3 males, *C. nauseosus consimilis* (P,N); 1 female, 4 males, *C. viscidiflorus stenophyllus* (P,N); 2 females, *C. v. typicus* (P,N); 1 female, *Grindelia* sp., (P,N); 4 females, 3 males, *Haplopappus bloomeri angustatus* (P,N); 1 male, *Senecio* sp.; 4 females, 2 males, *Solidago* sp., (P,N).

This is the largest *Cnemidandrena.* It was named *colletina* because of its superficial similarity to some large colletids. It is easily distinguished from all other *Cnemidandrena* by its large size, the punctured clypeus, and the black hairs laterally on the discs of metasomal terga 2 to 4, with the facial foveal vestiture white.

Andrena (Cnemidandrena) surda Cockerell

Andrena hirticincta var. *surda* Cockerell, 1910, Ann. Mag. Nat. Hist. (8)5:246 male (description).
Andrena pertarda Cockerell, 1916, Entomologist 49:157 female (description); 1931, Am. Mus. Novit. 458:1-20 (record, key); Lanham, 1941, Ann. Entomol. Soc. Am. 34:4, 702 (record, key).
Andrena surda, Cockerell, 1924, Pan-Pac. Entomol. 1(2)60 (female); 1931, Am. Mus. Novit. 458:1-20 (record, key); Lanham, 1941, Ann. Entomol. Soc. Am. 34:4, 702-713 (record, key); Buckell, 1949, Proc. Entomol. Soc. B. C. 45:29 (record); Krombein, 1958, U.S. Dep. Agric. Agric. Monogr. 2, suppl. 1:216 (record).
Andrena (Cnemidandrena) hirticincta surda, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification).
Andrena (Cnemidandrena) pertarda, Lanham, 1949. Univ. Calif. Publ. Entomol. 8:212 (classification).
Andrena (Cnemidandrena) surda, Linsley in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2: 1082 (classification, distribution).

FEMALE. *Measurements and ratios.* – N = 20; length, 8.6-11.2 mm; width, 2.9-3.5 mm; wing length, M = 3.22 ± 0.195 mm; FL/FW; M = 1.03 ± 0.017; FOVL/FOVW, M = 2.94 ± 0.190.

Integumental color. – Black except as follows: antenna red-brown ventrally beyond second flagellar segment; mandible with apical half red; tibial spurs light yellow; mediotarsi, distitarsi yellow; tegula shining brown; wing veins red-brown, wing membrane with very dark, almost black apical stigma; metasomal terga with wide apical depressed area hyaline, sterna with apical margin hyaline.

Structure. – Scape a little longer than flagellar segments 1 to 3; flagellar segment 1 subequal to flagellar segments 2 plus 3; flagellar segments 2 and 3 equal in length. Eye less than 3 times as wide as long, inner margin slightly diverging above except upper end incurved. Malar space extremely short, almost 10 times as wide as long. Mandible in repose extends for one-third its length beyond middle of labrum; notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea moderately tessellate, lateral surface narrower than dorsal surface. Maxillary palpus reaching to apex of galea; segmental ratio 0.8 : 0.9 : 0.7 : 0.7 : 0.7 : 0.7. Labial palpal basal segment moderately compressed and curved laterally, apical segment attached subapically, segmental ratio 0.3 : 0.6 : 0.5 : 0.5. Labral process less than twice as wide as long, weakly reflexed, apical emargination depth equal to one-third length of labral process. Clypeus moderately protuberant, extending for about one third its length below eyes, with round, coarse punctures except for a small, median, impunctate, polished area; punctures separated by 1 diameter medially, becoming somewhat smaller, more crowded, obscured by dense shagreening in dorsolateral half. Supraclypeal area with irregular longitudinal rugulae interrupting small punctures. Genal area 1.5 times as broad as eye; narrow shiny area near eye margin with small, shallow punctures separated by 1 to 4 diameters, remaining area shagreened. Vertex above lateral ocellus equals 1.5 ocellar diameters, coarsely tessellate with prominent punctures separated by one-half diameter. Supra-antennal area with longitudinal rugulae, with medium to large interrugal punctures. Facial fovea more than half length of eye, 3 times as long as broad, rounded above, narrowed below, reaching above to a line through lower edge of lateral ocellus and below to lower margin of antennal fossa.

Pronotum with humeral angle and ridge moderately developed, pronotal suture crossing humeral angle, shagreened throughout with small, weak punctures dorsally; scutum densely tessellate, with scattered punctures of irregular diameter. Scutellum densely tessellate in posterior half with large punc-

tures; small, nearly polished area anteriorly. Metanotum with very large punctures interrupted by dense tessellation. Propodeal enclosure tessellate laterally and posteriorly; central triangular area irregularly rugulate. Propodeal dorsoposterior surfaces tessellate with obscure punctures, lateral corbicular surfaces with coarse, reticular shagreening and medium-sized, widely spaced punctures in anterior fourth. Mesepisternum with moderate tessellation, crowded punctures above, becoming separated by 5 diameters below. Metepisternum shagreened, impunctate. Mesobasitarsus widest medially, equal in width to metabasitarsus, more than 2.5 times longer than wide. Metabasitarsus nearly 2.5 times longer than wide. Metatibia widest distally, narrowing sharply basally, more than one-fourth wider than meso- and metabasitarsus, 3 times longer than broad, Pterostigma more than 4 times longer than broad; vein 1st m-cu meets second submarginal cell well beyond middle.

Metasomal terga 1 to 4 with discs tessellate and medium-sized punctures separated by 3 to 6 diameters, but by 1 to 3 diameters on apical margins of discs. Tergum 5 with weak tessellation, punctures more prominent; posterior rim raised and thickened on more posterior punctures; punctures on disc separated by 2 to 4 diameters; on apical margin by one-half diameter or less. Apical areas of terga 1 to 5 shagreened. Pygidial plate smooth but dull, V-shaped, apex somewhat reflexed, edges anterior to reflexed area raised. Sternum 1 with small, median, V-shaped apical emargination, sterna 1 to 6 with small to medium-sized punctures separated by 2 diameters, lightly shagreened.

Vestiture. – Yellow except as follows: facial fovea with hairs white-yellow; metafemoral apical fimbria, basitarsi, and metasomal terga and sterna 5 and 6 black. Clypeus with narrow, median, longitudinal area naked or nearly so, hairs abundant laterally. Scutum with hairs short, moderately dense. Scutellum with anterior half or slightly less naked or nearly so. Propodeal corbicula with anterodorsal fourth with long, widely spaced hairs. Trochanteral floccus imperfect. Metasomal terga 1 to 4 with broad, dense, appressed apical fasciae covered half or a little more of terga; remaining areas with long, erect hairs dense laterally, longest medially on tergum 1, shorter on posterior terga. Tergum 5 nearly obscured by long, dense, posteriorly directed hairs. Sternum 1 with long, well spaced, erect hairs; sterna 1 to 5 with apical fringes, poorly developed in about median thirds; well developed laterally; sterna 2 to 5 with subapical fimbriae similar, short, erect, widely spaced hairs on remaining area.

MALE. *Measurements and ratios.* – N = 20; length, 7.2-10.7 mm; width, 2.2-3.1 mm; wing length, M = 2.86 ± 0.213 mm; FL/FW, M = 1.00 ± 0.028; FS1/FS2, M = 1.25 ± 0.079.

Integumental color. – Black except as follows: antenna dark grey-brown beyond first flagellar segment; mandible with apical third red; remainder as in female.

Structure. – Scape longer than flagellar segments 1 plus 2; flagellar segments 1 and 2 equal in length, shorter than succeeding segments. Eye almost 3.5 times as long as broad, inner margin diverging slightly above except for upper end slightly incurved. Malar space, mandible, and galea as in female except mandible without ventrobasal lamella. Maxillary palpus projecting slightly beyond apex of galea; segmental ratio 0.7 : 0.9 : 0.7 : 0.6 : 0.6 : 0.6. Labial palpus as in female except segmental ratio 1.0 : 0.6 : 0.3 : 0.5. Labral process strongly reflexed, length three-fourths width, apical emargination depth one-third length of labral process. Clypeus shining, noticeably protuberant; extending for one-third its length beyond lower level of eyes, with coarse punctures separated by one-half diameter except for small impunctate area medioventrally. Supraclypeal area as in female; rugulae extending laterally to paraocular areas with punctures interrupting rugulae above a line above antennal fossa. Genal area twice as wide as eye, weakly angulate to rounded posteriorly, sculptured as in female except shiny area near eye wider, remaining area coarsely shagreened. Vertex as in female. Thorax sculptured as in female except as follows: humeral angle and ridge more prominent with dorsal half of area posterior to humeral ridge with longitudinal rugulae, shagreening more dense than in female; anterior half of scutellum impunctate, polished; lateral face of propodeum moderately tessellate with scattered punctures, punctures more numerous in dorsal half. Wing as in female.

Metasomal terga 1 to 5 with discs irregularly tessellate with scattered punctures separated by 4 to 6 diameters, but more dense posteriorly; depressed apical margins smooth, polished. Sterna 1 to 6 finely shagreened with small punctures separated by 2 to 6 diameters. Sternum 1 with deep, V-shaped apical median emargination; sternum 2 with broad, shallow, apical median emargination. Sternum 7 (fig. 113) with apex broadly truncate, long hairs projecting posteriorly; basal apodeme narrowing anteriorly. Sternum 8 (fig. 114) with apex truncate, expanded, apex and neck region equal to basal region; apex and neck with abundant, long hairs extending laterally onto basal region. Gonoforceps (figs. 110 to 112) in dorsal and ventral views flattened and expanded apically; in lateral view appearing

narrowed. Penis valves expanded laterally, expansions blunt at tip; penis strongly bent downwards.

Vestiture. – Yellow throughout, slightly less colored ventrally. Metasomal hair distribution as in female except hairs on tergum 5 similar to hairs on terga 3 to 4. Sternal hairs longer than in female, apical fringes strongly developed, not appressed.

Variation. – In females a very few, fine hairs may be present on the medioventral clypeal area. The propodeal enclosure may be depressed medially. In both sexes the wing membranes may appear slightly infumate throughout; the integument may be red-brown or dark red-brown throughout; mediotarsi and distitarsi are often very yellow. In males, the anterior half of the scutellum may be lightly shagreened; sternum 7 apically varies from somewhat emarginate to convex.

Type material. – The holotype male of *A. hirticincta surda* (BLNM) was collected in Colorado by Morrison (no date given). The holotype female of *A. pertarda* (PHT) was collected in Boulder, Boulder Co., Colorado, on October 4, 1915, by Cockerell. The neallotype male of *A. surda* (UCD) (here designated) was taken at Boca Dam, Nevada Co., California, on August 24, 1968 on *Solidago* sp., by R. J. Donovan.

Parasites. – One male from Cranbrook, British Columbia, has two mite hypopi just above the right compound eye. One male from Teton Co., Idaho, has one female stylops in its abdomen.

Range and localities. – This species ranges south to Meadow Valley, 10 km S. Colonia Garcia, Sierra Madre, Chihuahua, MEXICO, west to the Sierra of California and the western two-thirds of Oregon and Washington, north to southern British Columbia, Alberta and Saskatchewan, and east to eastern Nebraska (map 15). Altogether, 144 females and 64 males were examined. Altitude records range from 937 m to 2,906 m, with most from 2,190 m to 2,800 m. The following list of localities from which *A. surda* has been collected includes those from the literature.

ALBERTA. Medicine Hat.

ARIZONA. *Apache Co.:* Diamond Rock, White Mountains. *Coconino Co.:* Houserock Valley. *Pima Co.:* Tucson.

BRITISH COLUMBIA. Ashcroft, Cranbrook, Invermere, Lake Windermere, Oliver, Peachland, Spence's Bridge, Summerland.

CALIFORNIA. *Alpine Co.:* Carson Pass, Sonora Pass, Winnemucca Lake. *Amador Co.:* Silver Lake. *Inyo Co.:* Big Pine Creek, Bishop Cr. *Mono Co.:* 13 km N.W. Bridgeport, Fales Hot Springs, Pickel Meadow, Sonora Pass. *Nevada Co.:* Boca, Boca Dam, 2 km S. Hobart Mills. *Placer Co.:* Carnelian Bay Lake Tahoe, Lake Tahoe. *Shasta Co.:* Lassen Peak. *Sierra Co.:* Independence Lake. *Siskiyou Co.:* Lava Beds National Monument, Shovel Creek Meadow, Willow Creek Mountain. *Tuolumne Co.:* Blue Canyon Sonora Pass, Chipmunk Flat, Sonora Pass, 3 km W. Sonora Pass.

COLORADO. *Boulder Co.:* Boulder, Ward. *Chaffee Co.:* 10 km W. Buena Vista. *Fremont Co.:* Coaldale, 6 km S. Coaldale, 10 km S. Coaldale. *Garfield Co.:* 19 km N. Rifle. *La Plata Co.:* Durango. *Larimer Co.:* Cache La Poudre Canyon Watrous Park, Estes Park, Meadows Estes Park, Virginia Dale. *Mesa Co.:* Grand Mesa Lands End Road. *Moffat Co.:* 16 km S. Mt. Hamilton. *Montezuma Co.:* Mesa Verde. *Pitkin Co.:* Aspen. *Rio Blanco Co.:* Meeker. *Saguache Co.:* Saguache.

IDAHO. *Bingham Co.:* Fort Hall. *Lemhi Co.:* 21 km S. Salmon. *Teton Co.*

MEXICO. CHIHUAHUA: Meadow Valley, 10 km S. Colonia Garcia, Sierra Madre.

MONTANA. *Beaverhead Co.:* 19 km W. Dillon. *Lewis and Clark Co.:* Helena. *Musselshell Co.:* Roundup. *Park Co.:* Yellowstone National Park near Gardiner, West Yellowstone National Park.

NEBRASKA. *Cuming Co.:* West Point. *Douglas Co.:* Omaha. *Lancaster Co.:* Lincoln.

NEVADA. *Clark Co.:* Kyle Canyon Charleston Mountains. *Douglas Co.:* Dagget Pass. *Elko Co.:* 13 km W. Oasis, Wells. *White Pine Co.:* 13 km W. Baker Creek Camp Baker, 14 km S.E. Ely, 26 km S. Ely.

NEW MEXICO. *Catron Co.:* 3 km S.E. Luna, Willow Creek Mountains.

NORTH DAKOTA. *Billings Co.:* Medora, Theo. Roos. Mem. Park. *Golden Co.:* 16 km W. Medora. *Morton Co.:* Mandan.

OREGON. *Baker Co.:* Antony Lake Blue Mountains, Antony Dutch Flat Trail Blue Mountains, Baker. *Clackamas Co.:* Mt. Hood, Timberline nr. Government Camp. *Crook Co.:* 26 km N.E. Prineville *Grant Co.:* Dixie Butte. *Harney Co.:* Antelope Mountain, Fish Lake, Fish Lake Steens Mountains. *Jefferson Co.:* Pamelia I. Mt. Jefferson, Whitewater Ridge Mt. Jefferson. *Klamath Co.:* 95 km E. Klamath Falls. *Lake Co.:* Drake Peak, Summer Lake. *Wallowa Co.:* Enterprise.

SASKATCHEWAN. Eastend.

SOUTH DAKOTA. *Custer Co.:* Custer. *Lawrence Co.:* Deadwood.

UTAH. *Kane Co.:* Orderville. *Rich Co.:* Laketown. *San Juan Co.:* Monticello. *Sevier Co.:* Big Rock Candy Mountain. *Weber Co.:* Willard Peak.

WASHINGTON. *Kittitas Co.:* Colockum Pass. *Pacific Co.:* Ocean Park. *Yakima Co.:* N. Yakima.

WYOMING. *Albany Co.:* Centennial, 16 km S.E. Laramie, Rock River. *Freemont Co.:* 21 km S.W. Dubois, Baldwin Creek 5 km N.W. Landers, Baldwin Creek 5 km W. Landers, South Pass. *Park Co.:* Buffalo Bill Reserve. *Sheridan Co.:* Sheridan. *Teton Co.:* Jackson. *Uinta Co.:* Fort Bridges.

Flight records. – Females have been taken from July 6 to October 10, and males have been taken from July 21 to October 3. Most records are in late July, and August and September.

Floral records. – Females of this species collect pollen primarily from species within the Astereae. A total of 18 females and 17 males visited the following flower species: 1 female, *Achillea millefolium* (N); 3 females, *Aster* sp., (P,N); 1 female, 1 male, *Chrysothamnus* sp., (N); 2 females, *C. nauseosus,* (N); 1 male, *C. viscidiflorus typicus;* 2 females, *Eriogonum* sp., (P,N); 1 male, *Gossypium* sp.; 4 females, *Grindelia* sp., (P,N); 1 female, *Haplopappus* sp., (P,N); 2 males, *Melilotus alba;* 1 male, *Polygonum* sp.; 6 females, 7 males, *Solidago* sp., (P,N); 1 female, 4 males, *Spenosciadium capitellatum* (P,N; but the load is small and some Compositae pollen grains are present).

The yellow pubescence with black hairs on metasomal tergum 5 and the wings with a very dark, apical spot readily separate *A. surda* from other species of *Cnemidandrena.* Its closest relative seems to be *A. luteihirta* which is similarly colored except that *A. luteihirta* has the pubescence citrus yellow throughout.

Andrena (Cnemidandrena) luteihirta Donovan, n. sp.

FEMALE. *Measurements and ratios.* – N = 20; length, 8.2-10.6 mm; width, 2.7-3.4 mm; wing length, M = 2.95 ± 0.113 mm; FL/FW, M = 1.0 ± 0.075; FOVL/FOVW, M = 2.79 ± 0.227.

Integumental color. – Black except as follows: antenna red-brown beneath beyond second flagellar segment; mandible with apical half red; legs light brown; tibial spurs light yellow; tegula and wing veins yellow-brown; wing membrane strongly darkened apically, slightly smokey throughout; apical margins of metasomal terga and sterna narrowly hyaline; pygidial plate dark red.

Structure. – Scape equal in length to flagellar segments 1 to 3; flagellar segment 1 slightly longer than flagellar segments 2 plus 3. Eye more than 4 times longer than broad with inner margin diverging slightly above except for upper end incurved. Malar space 9 times wider than long. Mandible in repose extends beyond middle of labrum for less than one-fourth its length; notch of mandible tooth almost equidistant between mandible apex and middle of labrum. Galea moderately tessellate, lateral surface equal in width to dorsal surface. Maxillary palpus reaching just to apex of galea; segmental ratio 0.8 : 0.9 : 0.7 : 0.6 : 0.4 : 0.5. Labial palpus with basal segment laterally compressed, curved; apical segment attached subapically, penultimate segment slightly so; segmental ratio 1.3 : 0.5 : 0.3 : 0.6. Labral process twice as wide as long, slightly reflexed, apical emargination shallow, depth one-sixth length of labral process. Clypeus slightly protuberant, projecting below eyes for less than one-third its length, except for median impunctate line with large punctures crowded laterally, separated near median area by one-half diameter; whole surface shagreened, less so medially. Supraclypeal area closely punctured, shagreened. Genal area less than 1.6 times as wide as eye, with small punctures separated by 2 to 4 diameters, with reticular shagreening except narrow area near eye margin smooth. Vertex above lateral ocellus equals more than 1.5 ocellar diameters, with punctures separated by 2 diameters near ocellus, crowded at apex, punctures obscured by moderate tessellation. Face above antennae longitudinally rugulate, rugulae obscuring indistinct punctures. Facial fovea less than 3 times longer than wide, widened above, narrowed below, extending above where outline indistinct to a line above median ocellus, below to a line just below antennal fossa.

Pronotum with humeral angle and ridge well developed except humeral angle almost absent where reached by pronotal suture; whole area with reticular shagreening. Remainder of mesosoma dorsally with moderate shagreening except as follows: scutellum with anterior third smooth, polished; propodeal enclosure with deep, broad, median longitudinal depression with short rugulae along anterior margin; dorsoposterior surfaces with medium-sized, widely spaced punctures in about anterodorsal fourth, with weak tessellation. Mesepisternum dorsally with moderate tessellation and punctures sepa-

rated by 2 diameters, below with weak tessellation and small, scattered punctures. Metepisternum with reticular shagreening, impunctate. Mesobasitarsus more than 3 times longer than wide, widest medially, slightly broader than metabasitarsus. Metabasitarsus 3.5 times longer than broad, widest basally. Metatibia slightly curved toward median line of bee, widest distally, 3.5 times longer than broad, one-fourth wider than mesobasitarsus. Pterostigma 4 times longer than broad; vein 1st m-cu meets second submarginal cell just beyond middle.

Metasomal terga 1 to 5 weakly tessellate, shiny, tessellation less evident on apical hyaline areas; terga 1 to 4 with small punctures separated by 4 to 6 diameters medially on discs, more crowded apically and laterally on discs. Tergum 5 with large punctures at least twice diameter of punctures on terga 1 to 4; separated by 2 and one-half diameters. Pygidial plate V-shaped, apex truncate, edges raised, basal half weakly tessellate, apical half smooth. Sterna 1 to 6 with reticular shagreening; sternum 1 with large punctures separated by 2 to 4 diameters, apically with moderately deep, median emarginations one-fifth as deep as wide; sterna 2 to 6 with small punctures separated by 2 to 4 diameters.

Vestiture. – Citrus yellow except less colored ventrally; trochanteral floccus nearly white; metasomal sternal fringes nearly white. Clypeus with hairs sparse medioventrally. Propodeal corbicula with widely spaced, long hairs in anterodorsal quarter. Trochanteral floccus imperfect. Metasomal tergum 1 with long, erect hairs throughout but sparse medially, becoming appressed apically forming a wide fascia. Tergum 2 with shorter hairs in median third, short hairs laterally. Terga 1 to 4 with wide compact fasciae obscuring more than half terga. Tergum 5 obscured by long, dense, appressed pubescence. Sternum 1 with erect hairs throughout; sternum 2 with hairs of moderate length in median third; sterna 2 to 6 with subapical fimbriae of long, erect hairs in about median thirds; sterna 2 to 4 with apical fringes of very short, appressed hairs.

MALE. *Measurements and ratios.* – N = 13; length, 7.0-9.6 mm; width, 2.2-2.8 mm; wing length, M = 2.43 ± 0.166 mm; FL/FW, M = 0.99 ± 0.034; FS1/FS2, M = 1.21 ± 0.110.

Integumental color. – Black except as follows: antenna dark brown ventrally beyond first flagellar segment; mandible with apical third red; tibial spurs and basal half of tarsal claws light yellow; apical half of tarsal claws red; tegula and wing veins brown; pterostigma dark brown; wing membrane hyaline except strongly darkened apically; metasomal terga with apical margin broadly hyaline; pygidial plate red; sterna with apical margin narrowly hyaline.

Structure. – Scape 1.2 times longer than flagellar segments 2 plus 3; flagellar segment 1 1.3 times longer than flagellar segment 2, equal to flagellar segment 3. Eye less than 4 times longer than broad, inner margin diverging above except for upper end curved inwardly. Malar space, mandible and galea as in female except mandible without ventrobasal lamella. Maxillary palpus projecting slightly beyond apex of galea, segmental ratio 0.7 : 0.9 : 0.6 : 0.6 : 0.4 : 0.4. Labial palpus as in female except segmental ratio 1.2 : 0.5 : 0.4 : 0.3. Labral process strongly reflexed, twice as wide as long, depth of apical emargination one-third length of labral process. Clypeus nearly flat, extending for slightly more than one-fourth its length below eyes; with large punctures medially separated by 2 to 4 diameters, punctures on dorsolateral periphery smaller and more crowded, median two-thirds shiny, dorsolateral third shagreened. Supraclypeal area, genal area, vertex and supra-antennal area as in female with paraocular areas sculptured as for supra-antennal area, and genal area 1.3 times wider than eye, rounded to weakly angulate posteriorly.

Pronotum with humeral angle and ridge moderately developed, but poorly so above weak pronotal suture where suture crosses humeral ridge, with reticular shagreening dorsally and on ventral half of area between humeral ridge and pronotal lobe, remainder with weak dorsoventral rugulae. Remainder of thorax dorsally with moderate tessellation except as follows: about anterior median two-thirds of scutellum polished; propodeal enclosure with irregular rugulae except for narrow lateral areas; dorsoposterior areas of propodeum with small punctures separated by 1 to 2 diameters; lateral areas with weak tessellation. Mesepisternum weakly tessellate with small punctures separated by 2 to 4 diameters; metepisternum with reticular shagreening.

Metasomal terga 1 to 5 with reticular shagreening, surfaces shiny, with small punctures separated on discs by 1 to 3 diameters, more crowded apically. Sternum 1 with deep, V-shaped, apical median emargination; sterna 1 to 6 with reticular shagreening, with small punctures separated by 3 diameters. Sternum 7 (fig. 118) with basal apodemes wider basally, deeply emarginate apically with processes on each side of emargination with long hairs. Sternum 8 (fig. 119) with apex and neck region slightly longer than basal region; neck narrow with abundant long hairs. Gonoforceps (figs. 115 to 117) in dorsal and

ventral view flattened and expanded. Penis valves strongly expanded laterally; lateral expansions rounded apically; apex of penis valves expanded, lobelike.

Vestiture. – Pubescence citrus yellow throughout but less colored ventrally. Metasomal terga with vestiture as in female except apical fasciae with hairs less appressed. Sternal vestiture as in female except apical fringes with hairs longer.

Variation. – In both sexes the integumental color may be either black or red-brown except for the antennae and in the male the light yellow tarsi. The arrangement of rugulae in the propodeal enclosure may vary. One male from Antioch, Contra Costa Co., California, is much larger than normal. One male from 10 km E. Warner Pass, Lake Co., Oregon, and 1 male from Antioch, Contra Costa Co., California, have the seventh sternum truncate apically. One male from Antioch, Contra Costa Co., California, has 1 wing with 2 submarginal cells; the other wing with 3.

Type material. – The holotype female (UCD no. 405) was collected at Antioch, Contra Costa Co., California, on September 8, 1948, by J. W. MacSwain. The allotype male (UCD) was collected at Antioch, Contra Costa County, California, on September 9, 1952, by J. W. MacSwain. The following 35 specimens (30 females and 5 males) have been designated as paratypes. CALIFORNIA. *Contra Costa Co.,* Antioch, 5 females, (CAS) September 13, 1936, E. C. Van Dyke; 1 female, (CAS) September 9, 1940, E. C. Van Dyke; 1 female, (CAS) September 10, 1937, E. C. Van Dyke; 1 female, (CAS) September 9, 1936, E. C. Van Dyke; 1 female, (GEB) September 2, 1934, G. E. Bohart; 2 females, (GEB) September 21, 1938, G. E. Bohart; 1 female, (GEB) July, 1941, G. E. Bohart; 2 females, 1 male, (GEB) September 6, 1936, G. E. Bohart; 1 female, (GEB) September 6, 1936, G. E. and R. M. Bohart; 2 females, 1 male, (UCB) September 13, 1936, E. G. Linsley, 1 female and 1 male on *Eriogonum* sp.; 2 females, (UCB) September 13, 1952, J. W. MacSwain; 1 female, (UCB) October 23, 1938, J. W. MacSwain; 1 male, same data as allotype male; 1 female, (UCB) August 25, 1955, J. G. Rozen, on *Eriogonum* sp.; 1 female, (UCB) September 1, 1965, P. D. Hurd; 1 female, (GIS) September 5, 1955, G. I. Stage; 1 female, (GIS) September 3, 1956, G. I. Stage; 1 female, (GIS) September 9, 1958, J. R. Powers; 1 male, (RWT) September 25, 1959, R. W. Thorp; 4 females, (UCD) September 7, 1968, B. J. Donovan; 1 female, 1 male, (UCD) September 30, 1969, B. J. Donovan.

Parasites. – One female from Antioch, Contra Costa Co., California, carries 1 triungulin.

Range and localities. – This species is restricted to California except for one male from southern Oregon. In California the distribution is somewhat disjunct, ranging from about 1,250 m or more in Inyo County to near sea level at Antioch in Contra Costa County (map 13). Totals of 92 females and 13 males were examined. Localities are listed below.

CALIFORNIA. *Alameda Co.:* Tesla. *Contra Costa Co.:* Antioch. *Inyo Co.:* Fish Springs 8 km S. Big Pine. *Los Angeles Co.:* Big Pines Angeles National Forest. *Monterey Co.:* Paraiso Springs. *San Bernardino Co.:* Barton Flat South Fork Camp, Big Bear Velley, Forest House, Mill Creek Cal. S. Bernardino Mountains 1,875 m, Santa Ana Canyon, Upper Santa Ana River.

OREGON. *Lake Co.:* 10 km E. Warner Pass.

Flight records. – Females have been taken from July ? to October 23, and males have been taken from August 3 to September 30.

Floral records. – *A. luteihirta* females collect pollen primarily from species within the Astereae. A total of 48 females and 3 males have been taken on the following flower species: 9 females, *Chrysothamnus* sp., (P,N); 2 females, *C. nauseosus* (P,N); 2 females, *C. n. occidentalis* (P,N); 1 female, *C. parryi* (P,N); 13 females, 2 males, *Eriogonum* sp., (P,N); 13 females with *Eriogonum* sp., pollen, 3 females with *Eriogonum* sp., pollen mixed with Compositae pollen, 2 females with Compositae pollen only, and 5 females without pollen); 1 female, *E. californicus* (P,N); 1 female, *E. fasciculatum* (P,N); 1 male, *E. nudum;* 15 females, *Grindelia camporum* (P,N); 1 female, *Gutierrezia californicus* (N); 1 female, *Solidago* sp., (P,N); 1 female, *S. californica* (P,N); 1 female, *S. confinis* (P,N).

This species is similar to *A. surda,* but the vestiture is citrus yellow throughout; it is much larger than *A. citrinihirta* or *A. aurihirta,* the two other species with citrus yellow vestiture, and the wings are much darker apically. The male of *A. luteihirta* is very similar to the male of *A. surda,* and, with the like similarity between the females of these two species, suggests that the relationship of these species is close. *Andrena surda* is widely distributed in about the western half of North America except for Southern California and areas west of the Sierra Nevada, and it is in these areas that *A. luteihirta* is found. This dis-

tributional pattern suggests that one population originally inhabited both areas, and the west coast population was reproductively isolated from the remainder, probably by climate change. Independent evolution and reinvasion of areas has probably led to the present species distinction and distribution.

Andrena (Cnemidandrena) chromotricha Cockerell

Andrena chromotricha Cockerell, 1899, Entomologist 32:128 female; 1906. Trans. Am. Entomol. Soc. 32 (record).

Andrena apacheorum var. a. of Cockerell, 1900, Ann. Mag. Nat. Hist. (7)5:403-404 (401-416) (description).

Andrena clypeonitens Cockerell, 1902, Can. Entomol. 34:47 female (description); 1936. Can. Entomol. 68:283 (relationship).

Andrena beulahensis Viereck, 1903, Trans. Am. Entomol. Soc. 29:53 (description); Cresson, 1929, Mem. Am. Entomol. Soc. 5:58 (list).

Andrena truncata Viereck, 1903, Trans. Am. Entomol. Soc. 29:53 (description); Cresson, 1929, Mem. Am. Entomol. Soc. 5:65 (list).

Andrena chromotricha beulahensis, Cockerell, 1906, Trans. Am. Entomol. Soc. 32:296 (record, relationship).

Andrena chromotricha clypeonitens, Cockerell, 1906, Trans. Am. Entomol. Soc. 32:296 (record, relationship).

Andrena (Cnemidandrena) chromotricha, Lanham, 1949, Univ. Calif. Publ. Entomol. 8:212 (classification); Linsley in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1061; Mitchell, 1960, N.C. Agric. Exp. Stn. Tech. Bull. 141, 1:172-173 (description, distribution).

Andrena (Cnemidandrena) beulahensis, Linsley in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1058 (classification, record).

FEMALE. *Measurements and ratios.* – N = 20; length, 7.5-9.7 mm; width, 2.5-3.1 mm; wing length, M = 2.67 ± 0.129 mm; FL/FW, M = 1.07 ± 0.352; FOVL/FOVW, M = 3.62 ± 0.134.

Integumental color. – Black except as follows: antenna somewhat lighter beyond second flagellar segment; mandible with apical half red; tibial spurs light yellow; tarsal claws red; tegula shining yellow-brown; wing veins and pterostigma brown; wing membrane lightly smoked in about apical half; metasomal terga and sterna with apical margin hyaline; pygidial plate dark red-black.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 equal in length to flagellar segments 2 plus 3. Eye slightly less than 4 times longer than broad, inner margin converging strongly above. Malar space one-seventh as long as broad. Mandible in repose extends for one-fourth its length beyond middle of labrum; notch of mandible tooth equidistant between middle of labrum and mandible apex. Galea weakly tessellate, dorsal surface 1.5 times wider than lateral surface. Maxillary palpus with apical half of apical segment projecting beyond apex of galea; segmental ratio 0.8 : 1.0 : 0.7 : 0.7 : 0.7 : 0.7. Labial palpal basal segment moderately compressed laterally, weakly curved; apical segment attached subapically, segmental ratio 1.7 : 0.7 : 0.6 : 0.6. Labral process nearly flat, broad, short, more than 3 times wider than long; median emargination shallow, broad, depth one-fifth length of labral process. Clypeus moderately protuberant, extending below eyes for almost half its length; lower median half with "beaten" appearance, impunctate, polished, remaining areas with reticular shagreening and large punctures separated by 2 diameters. Supraclypeal area with dense shagreening obscuring weak punctures. Genal area slightly angulate posteriorly, almost twice as wide as eye, with small punctures separated by 3 diameters, third nearest eye smooth, shining, remainder shagreened, dull. Vertex above lateral ocellus slightly wider than 1 ocellar diameter, moderately tessellate towards apex with deep punctures separated by 1 diameter. Facial fovea more than half length of eye, deep, rounded above, narrowing below, reaching above to a line through lateral ocellus, below to a line below antennal fossa.

Pronotal humeral angle and ridge moderately developed, humeral ridge somewhat depressed where crossed by pronotal suture, with reticular shagreening throughout. Remainder of thorax dorsally moderately tessellate, dull; posterior halves of scutellum and metanotum with large, crowded punctures; propodeal enclosure with shallow, median, longitudinal depression, anterior edge with short, irregular rugulae, dorsoposterior area with medium-sized punctures separated by 2 to 3 diameters.

Mesepisternum moderately tessellate with large, deep punctures crowded dorsally, punctures weaker and scattered ventrally. Metepisternum weakly shagreened, impunctate except for a few small punctures dorsally. Propodeal corbicular area with reticular shagreening, with a few, scattered, deep punctures in anterodorsal third. Mesobasitarsus moderately expanded medially, 3 times longer than wide, slightly wider than metabasitarsus. Metabasitarsus widest basally, 4 times longer than wide. Metatibia widest distally, 3.5 times longer than wide, one-half wider than metabasitarsus. Tegula and wing veins brownish; pterostigma dark brown, 4 times longer than wide. Wing membranes with whole apical margin moderately clouded, vein 1st m-cu meets second submarginal cell one-third distance from apex of cell.

Metasomal terga 1 to 4 with discs moderately tessellate with very few, small, scattered punctures except punctures larger, separated by 1 to 3 diameters laterally on tergum 1, and on apical margins of discs of terga 2 to 4; apical areas with reticular shagreening. Tergum 5 with reticular shagreening throughout, middle third almost impunctate, remainder with prominent punctures separated by 1 to 2 diameters. Pygidial plate V-shaped, shagreened, with median third raised. Sternum 1 with small, median, V-shaped emargination, sterna 1 to 6 lightly shagreened, sterna 1 and 2 with prominent punctures separated by 3 to 4 diameters, sterna 3 to 6 with smaller punctures on apical halves.

Vestiture. – White except as follows: tarsal hairs brown; vestiture posterior to metasomal tergum 4 brown. Lower median half of clypeus naked. Propodeal corbicular area with sparse hairs in anterior third. Trochanteral floccus imperfect. Metasomal tergum 1 with apical fascia of sparse, erect hairs, extending forwards laterally; terga 1 to 4 with apical fasciae of appressed, short hairs, fasciae obscuring one-third or less of terga, areas between fasciae with extremely few, short hairs; tergum 5 with thin covering of posteriorly directed hairs. Sternum 1 with erect hairs throughout, sternum 2 with erect hairs throughout, sternum 2 with erect hairs on median third; sterna 2 to 6 with subapical fimbriae well developed laterally; sternum 1 with appressed, apical fringe, fringes absent or nearly so on remaining sterna.

MALE. *Measurements and ratios.* – N = 14; length, 5.9-8.5 mm; width, 1.8-2.1 mm; wing length, M = 2.31 ± 0.109 mm; FL/FW, M = 0.89 ± 0.078; FS1/FS2, M = 1.46 ± 0.107.

Integumental color. – Black except as follows: antenna brown beyond first flagellar segment; remainder as in female except metasomal terga and sterna with apical margin broadly hyaline.

Structure. – Scape a little shorter than flagellar segments 1 to 3; flagellar segment 1 three-fourths length of flagellar segments 2 plus 3. Eye 3.5 times longer than wide, inner margin converging strongly above. Malar space very short, 9 times wider than long. Mandible in repose extending for somewhat less than one-fourth its length beyond middle of labrum, notch of mandible tooth one-fourth of distance between middle of labrum and mandible apex from middle of labrum. Galea as in female. Maxillary palpus with half apical segment projecting beyond apex of galea; segmental ratio 0.6 : 0.8 : 0.5 : 0.6 : 0.6 : 0.7. Labial palpus as in female except segmental ratio 1.2 : 0.5 : 0.5 : 0.8. Labral process strongly reflexed, twice as wide as long, depth of median emargination half length of reflexed area. Clypeus moderately protuberant, two-thirds projecting below level of eyes; median area with "beaten" appearance; whole area with large punctures, separated by 1 diameter on dorsolateral periphery, very few punctures on lower median area, whole clypeus lightly shagreened, shiny. Supraclypeal area heavily shagreened with coarse, irregular punctures between antennal fossae. Genal area less than 3 times as wide as eye, with posterior margin strongly carinate between vertex and opposite mid-point of eye (figs. 8 and 9), sculptured as in female. Vertex less than 1.5 times diameter of lateral ocellus, sculptured as in female. Supra-antennal area as in female, with paraocular areas similarly sculptured.

Pronotum with humeral angle and ridge very well developed, crossed medially by pronotal suture but humeral ridge little depressed, slightly carinate above pronotal suture; pronotum weakly tessellate above humeral angle, area above pronotal suture with dorsoventral rugulae, below pronotal suture smooth, shiny. Remainder of thorax sculptured as in female.

Metasomal terga 1 to 5 and sterna 1 to 6 shagreened throughout with small, scattered punctures, punctures absent on large, median area of tergum 1. Sternum 1 with broad, shallow, median, V-shaped, apical emargination. Sternum 7 (fig. 123) with basal apodemes narrowly incurving apically, broadly and shallowly emarginate apically, processes on each side of emargination with short, sparse hairs. Sternum 8 (fig. 124) with apex and neck region slightly longer than basal region; apex broad, truncate; neck area with abundant, long hairs. Gonoforceps (figs. 120 to 122) in dorsal and ventral views bluntly expanded apically. Penis valves in dorsal and ventral views moderately wide basally, narrow-

ing gradually to apex except apex expanded, rounded; in lateral view angulate dorsally, downcurved and pointed apically.

Vestiture. – White throughout. Clypeus with median, "beaten" area naked. Metasomal tergum 1 with very weak, apical fascia of nearly erect hairs, hairs more abundant laterally and anteriorly. Terga 2 to 4 with poorly developed apical fasciae of short, appressed hairs, discs with thin scattering of short, fine, erect hairs, hairs more abundant laterally. Tergum 5 with numerous, nearly appressed hairs apically, disc as for terga 2 to 4. Sterna 1 to 6 with thin scattering of long, nearly erect hairs projecting posteriorly.

Variation. – In both sexes the median "beaten" area of the clypeus varies from nearly smooth to very "beaten," and the punctation of this area varies from impunctate to few punctures throughout. The inner eye margins vary in degree of dorsal convergence, but are always distinctly convergent, not nearly parallel.

Type material. – The holotype female of *A. chromotricha* (NMNH no. 3933) was taken at Forks of Ruidoso Creek, Lincoln Co., New Mexico, by C. M. Barber on July 30, 1898. The holotype female of *A. clypeonitens* (NMNH no. 18,934) was taken at Milwaukee, Milwaukee Co., Wisconsin, by S. Graenicher on August 19 (no year given). The holotype female of *A. beulahensis* (ANSP no. 4108) was taken at Beulah, San Miguel Co., New Mexico, by H. Skinner on August 17, 1901. The holotype female of *A. truncata* (ANSP no. 4109) was taken at Beulah, San Miguel Co., New Mexico, by H. Skinner on August 17, 1901.

Parasites. – None.

Range and localities. – *Andrena chromotricha* is found across the eastern half of the northern tier of states and southern Canada, and south through the middle of the United States to Arizona and New Mexico. Altitude records are 1,563 m, 2,500 m, and 2,813 m. In all, 91 females and 15 males were examined. All locality records, published and unpublished, are given below.

ARIZONA. *Gila Co.:* Mogallon Rim. *Greenlee Co.:* Hannagan.

COLORADO. *Chaffee Co.:* St. Ann, Poncha Dam. *El Paso Co.:* Colorado Springs. *Jefferson Co.:* Morrison. *Park Co.:* Deer Creek Canyon, Platte Canon.

IOWA. *Woodbury Co.:* Sioux City.

MANITOBA. 6 km S. Delta, 11 km W. Headingly, 3 km W. High Bluff, Keld, 8 km N. Portage La Prairie, 10 km S. St. Boniface.

MINNESOTA. *Carver Co.:* Zumbra Heights. *Clay Co.:* Moorhead. *Dakota Co.:* Hastings. *Grant Co.:* Ashby. *Martin Co.:* Fairmont. *Norman Co.*

NEBRASKA. *Cherry Co.:* Valentine.

NEW MEXICO. *Lincoln Co.:* Forks of Ruidoso, White Mountains S. Fork Eagle Creek. *San Miguel Co.:* Hill above Beulah, Sapello.

NEW YORK. *Tompkins Co.:* Ithaca.

NORTH DAKOTA. *Cass Co.:* Fargo, 2 km S. Gardner. *Grand Forks Co.:* Grand Forks. *Ransom Co.:* 2 km S.E. McLeod. *Stutsman Co.:* Jamestown. *Williams Co.:* Williston.

OHIO. *Stark Co.*

ONTARIO. 8 km W. Carp, Jordan, Mamora, Ottawa.

UTAH. *Utah Co.:* Aspen Grove, Provo Canyon, Hope Campground, 8 km S. Springdell.

WISCONSIN. *Dane Co.:* Madison, Mazomanie. *Milwaukee Co.:* Milwaukee. *Trempealeau Co.*

Flight records. – One female was taken on May 5 and 1 in June. The next earliest record is on July 7, and the last is on September 13. Males have been taken from July 18 to August 19. The May 5 date for female collection is about a month earlier than the next earliest date, which suggests that it is erroneous.

Floral records. – Twenty-four females are recorded collecting pollen from at least 11 different plant species in 10 different genera. Flower records are as follows: 1 female, *Daucus carota* (N); 1 female, *Erigeron macranthus* (P,N); 1 female, *Grindelia squarrosa* (P,N); 2 females, *Helianthus* sp., (P,N); 2 females, *H. maximilliani* (P,N); 1 female, *H. tuberosa* (P,N); 1 female, *Melilotus alba* (N); 3 females, *Ratibida columnaris* (P,N); 2 females, 1 male, *Rudbeckia laciniata* (P,N); 1 female, *Senecio rishyi* (P,N); 6 females, *Sonchus arvensis* (P,N); 1 female, *Taraxacum taraxacum* (P,N); 2 females, *Tanacetum vulgare* (P,N).

Andrena chromotricha is separable from all other *Cnemidandrena* by the inner margins

of the compound eyes convergent above throughout their length, with the vestiture white throughout. It is distinctly and closely related to *A. peckhami,* as it shares with this species the inner margins of the compound eyes convergent above, and the males with a strongly developed genal ridge.

Andrena (Cnemidandrena) peckhami Cockerell

Andrena peckhami Cockerell, 1902, Ann. Mag. Nat. Hist. (7)9:105 (female); Graenicher, 1910, Can. Emtomol. 42:159 (taxonomy).

Andrena (Leucandrena) peckhami, Lanham, 1949. Univ. Calif. Publ. Entomol. 8(5):220 (classification); Linsley, in Muesebeck et al., 1951, U.S. Dep. Agric. Agric. Monogr. 2:1076.

Andrena (Gonandrena) peckhami, Krombein, 1967. U.S. Dep. Agric. Agric. Monogr. 2, suppl. 2:433 (distribution, flower records).

FEMALE. *Measurements and ratios.* – N = 6; length, 7.9-9.2 mm; width, 2.5-2.9 mm; wing length, M = 2.64 ± 0.053 mm; FL/FW, M = 1.05 ± 0.144; FOVL/FOVW, M = 3.37 ± 0.164.

Integumental color. – Black except as follows: antenna with brown tinge ventrally beyond about second flagellar segment; mandible with apical half red; tegula nearly black, wing veins very dark brown, pterostigma black centrally, peripherally dark brown; wing membrane with apical half moderately cloudy, basal half hyaline; tibial spurs dark yellow, mediotarsi, basitarsi, and basal half of tarsal claws dark brown-yellow; apical half of tarsal claws red; metasomal terga and sterna narrowly hyaline apically, pygidial plate dark red-black.

Structure. – Scape longer than flagellar segments 1 to 3; flagellar segment 1 longer than flagellar segments 2 plus 3; flagellar segment 2 shorter than flagellar segment 3. Eye less than 4 times longer than wide, with inner margin strongly converging above. Malar space 8 times wider than long. Mandible in repose with one-fourth its length projecting beyond middle of labrum; notch of mandible tooth equidistant between middle of labrum and mandible apex; ventrobasal angle slightly developed. Galea moderately tessellate with dorsal surface equal to or slightly wider than lateral surface. Maxillary palpus reaching to apex of galea; segmental ratio 0.9 : 1.1 : 0.8 : 0.8 : 0.8 : 0.8. Labial palpus weakly compressed and curved laterally, segmental ratio 1.6 : 0.8 : 0.8 : 0.9. Labral process with emarginate area weakly recurved, narrowing apically, twice as wide as long, apical emargination very shallow, depth one-seventh length of labral process. Clypeus moderately protuberant, extending below eyes for nearly two-thirds its length, in upper half with a broad, smooth, median, longitudinal, impunctate strip, strip broadening widely in lower half; laterally with large punctures separated by 1 diameter, punctures smaller, closer in upper periphery with moderate shagreening. Supraclypeal area with moderate tessellation obscuring punctation. Genal area wider than eye, posterior margin rounded; a narrow, shiny area near eye with small punctures separated by 1 diameter or more, remainder with widely spaced, larger punctures and reticular shagreening. Vertex above lateral ocellus raised, nearly 1.5 times wider than eye, with medium-sized, deep punctures separated by 1 diameter; moderately tessellate. Supra-antennal area with longitudinal rugulae, and small, obscure, close, interrugal punctures. Facial fovea deeply impressed, well defined, 3.5 times longer than wide, a little wider above than below, rounded at both ends, reaching above to a line through middle of lateral ocellus, reaching below to a line just below antennal fossa.

Pronotum with humeral angle and ridge moderately developed, pronotal suture not well defined, weakly crossing humeral ridge; pronotum above humeral ridge with small punctures, close dorsally, more widely spaced laterally above humeral ridge; whole pronotum with moderate, reticular shagreening. Scutum with medium-sized punctures separated by 2 diameters, with moderate tessellation. Scutellum with anterior two-thirds, except for punctures in median line and laterally, nearly impunctate and smooth, nearly shiny; posterior third with medium-sized punctures and moderate tessellation. Metanotum with anterior two-thirds with weak tessellation, few punctures; posterior third with roughened, crowded punctures and moderate tessellation. Propodeal enclosure with narrow, anterior fringe of weak, irregular rugulae, remainder moderately tessellate with a narrow, median, longitudinal depression; dorsoposterior surface with medium-sized punctures separated by 2 to 3 diameters except punctures closer laterally, moderately tessellate; lateral corbicular areas with widely spaced, medium-sized punctures in less than anterodorsal half, weakly tessellate. Mesepisternum with medium-sized punctures separated by 2 to 4 diameters, moderately tessellate. Metepisternum with small punctures in

upper half, lightly shagreened. Mesobasitarsus widest in broad, median area, nearly 3 times longer than wide, slightly wider than metabasitarsus. Metabasitarsus widest near base, less than 4 times longer than wide, two-thirds width of metatibia. Metatibia cuneate, curved ventrally, widest apically, 3.5 times longer than wide. Wing with pterostigma 4 times longer than wide, vein 1st m-cu meets second submarginal cell less than 1 vein width from end of cell.

Metasomal terga 1 to 4 with small to minute punctures on apical margins of discs; tergum 1 with punctures sparse on apical margin of disc, punctures sparsely present laterally and anteriorly on disc; terga 2 to 4 with punctures larger, more numerous apically on discs, closer, with weak tessellation. Tergum 5 with large, deep punctures with rim raised, punctures separated by 1.5 to 2 diameters. Terga 1 to 5 with reticular shagreening. Pygidial plate narrowly rounded apically, lateral edges and broad median area raised, apical half or less impunctate, remainder with small, close punctures. Sternum 1 with small, apical, median emargination; sterna 1 to 6 with medium-sized punctures separated by 2 diameters, except sterna 3 to 6 with broad, median, basal areas impunctate; sterna 1 to 6 with weak, reticular shagreening, nearly shiny.

Vestiture. – Clypeus with broad, median area naked, hairs white except long, apical hairs dark brown. Facial foveal hairs black; supraantennal hairs white except for a very few black hairs lying over facial foveae. Scutum with widely spaced, erect, black hairs except for intermixed, white hairs anteriorly and laterally. Scutellum with sparse, intermixed, black and white hairs. Propodeal corbicula with widely spaced, long, erect, plumose hairs in anterodorsal half or less. Leg hairs to femora white except apical fimbria of femur brown, tibial scopa with ventral hairs white, remaining leg hairs brown to black. Metasomal tergum 1 with hairs white, disc with long, erect, sparse hairs apically, shorter hairs laterally and anteriorly. Terga 2 to 4 with apical fasciae of short, appressed, white hairs obscuring one-third or less of terga, tergum 2 with fascia poorly developed medially; terga 2 to 4 with short, erect, sparse, black hairs on discs except only present laterally on tergum 2. Tergum 5 with long, dark brown to black hairs posteriorly directed, not obscuring surface. Sterna 1 to 4 with apical fringes weakly developed laterally, absent medially; sterna 2 to 5 with subapical fimbriae well developed laterally, very poorly developed in less than median thirds; sterna 1 to 6 with sparse, erect hairs except impunctate areas of sterna 3 to 5 naked; hairs of sterna 1 to 4 white, hairs of sterna 5 to 6 brown.

MALE. *Measurements and ratios.* – N = 1; length, 8.0 mm; width 2.1 mm; wing length 2.5 mm; FL/FW = 0.9; FS1/FS2, = 1.5.

Integumental color. – Black except as follows: antenna beyond first flagellar segment red-brown ventrally; mandible with apical third red; tibial spurs light yellow; apical half of tarsal claws deep red; tegula shining hyaline medium brown; wing veins and pterostigma dark brown; wing membrane with broad, apical area moderately darkened, remainder hyaline; metasomal terga and sterna moderately widely hyaline apically.

Structure. – Scape a little shorter than flagellar segments 1 to 3; flagellar segment 1 1.5 times longer than flagellar segment 2, longer than flagellar segment 3. Eye 3 times longer than wide, with inner margin converging strongly above. Malar space as in female. Mandible in repose with more than one-third its length projecting beyond middle of labrum; notch of mandible tooth one-third distance between middle of labrum and mandible apex. Galea as in female. Maxillary palpus with more than apical segment projecting beyond apex of galea; segmental ratio 1.0 : 1.2 : 1.0 : 0.9 : 0.9 : 1.1. Labial palpus with basal segment flattened, weakly curved laterally; segmental ratio 1.6 : 0.9 : 0.8 : 1.0. Labral process very strongly reflexed, length more than twice width, apical emargination obscure. Clypeus nearly flat with broad, median area depressed; extending below eyes for more than one-half its length, depressed area irregularly wrinkled, impunctate; remainder of clypeus with medium-sized punctures separated by less than 1 diameter, shiny. Supraclypeal area moderately shagreened with indistinct punctures. Genal area less than twice as wide as eye; from opposite lower third of eye to vertex produced to a very prominent carina, posterior two-thirds or more with very small, widely spaced punctures, remainder impunctate, with very light reticular shagreening, whole area shiny. Vertex above lateral ocellus equals 1.5 ocellar diameters, apex with medium-sized punctures separated by 1 diameter, moderately tessellate. Supra-antennal area as in female; paraocular areas as for supra-antennal area.

Pronotum with humeral angle and ridge very well developed, humeral ridge narrowly depressed where crossed by indistinct pronotal suture; dorsally with small punctures separated by 2 diameters; area above humeral ridge shagreened, area below humeral ridge with dorsoventral rugulae, except rugulae poorly developed in lower half, area shiny. Remainder of thorax as in female except as follows:

scutellum nearly shiny throughout; propodeum with lateral area with medium-sized punctures in about upper half, weakly tessellate.

Metasomal terga 1 to 5 with small punctures on apical areas of discs and basal halves of depressed areas separated by 2 diameters, except discs with punctures more widely spaced; terga 1 and 2 with fewer and smaller punctures than terga 3 to 5. Sterna 1 to 6 as in female. Sternum 7 (fig. 128) with basal apodemes narrowed anteriorly; apex truncate with lateral corners with sparse hairs. Sternum 8 (fig. 129) with apex broad, neck region merging gradually with basal region; neck area with abundant, long hairs. Gonoforceps (figs. 125 to 127) in dorsal and lateral view strongly ridged; flattened, weakly expanded apically. Penis valves in dorsal and ventral view narrowing gradually from base to apex except apex lobelike; in lateral view very long, projecting well below gonoforceps.

Vestiture. – Clypeus with hairs white, sparse, depressed median area naked medially. Vertex with some hairs black. Scutum, scutellum with sparse, erect hairs, most hairs black or brown, remainder white; remainder of thoracic hairs white. Metasomal tergum 1 with very sparse, long, erect hairs apically and laterally, disc nearly naked medially; terga 2 to 4 with apical fasciae of short, white, recumbent hairs; fasciae present on one-third of terga, except absent on median third on tergum 1; discs of terga 2 to 4 laterally with short, black, erect hairs; tergum 5 with disc with longer black hairs laterally, hairs becoming sparse medially. Sternum 1 with vestiture as in female; sterna 2 to 4 with strongly developed apical fringes of long, white hairs, sternum 5 with apical fringe of white hairs strongly developed on lateral aspects, apical fringe of very short hairs on broad median area; sterna 5 and 6 with brown-black hairs.

Variation. – In the females the width of the poorly developed median area of the apical fascia of metasomal tergum 2 varies slightly. It is small in the holotype, but much wider in the female paratypes. The sparse, erect hairs apically on tergum 1 show a similar variation, but in both cases increasing wear with age is probably responsible.

Type material. – The holotype female (NMNH no. 18919) was collected at Milwaukee, Milwaukee Co., Wisconsin, by S. Graenicher. The neallotype male (GSU) (here designated) was taken at Mount Lake Biological Station, Giles Co., Virginia, by J. W. Nuttycombe on July 31, 1937.

Parasites. – None.

Range and localities. – *Andrena peckhami* extends from South Carolina north to Ontario and west to southern Manitoba. Eight females and one male were studied. All locality data, including published records, are listed below.

MANITOBA. 3 km S.E. St. Vital, 2 km S. Brereton Lake.
MINNESOTA. *Roseau Co.:* Warroad.
NEW YORK. *Chautauqua Co.:* Otto.
NORTH CAROLINA. *Macon Co.:* Highlands.
ONTARIO. 8 km W. Carp.
VIRGINIA. *Giles Co.:* Mt. Lake Biological Station.
WISCONSIN. *Milwaukee Co.:* Milwaukee.

Flight records. – Females of this species have been taken from July 16 to August 8, and the male was taken on July 31.

Floral records. – Two females have flower host records; these are: 1 female, *Cirsium arvense* (P,N); 1 female, *Sonchus varensis* (P,N). The species has also been taken on flowers of *Baptisia* sp. and *Solidago* sp.

This species can be distinguished from other *Cnemidandrena* of North America by the inner margins of the compound eyes convergent above throughout their length and black hairs present on the head, mesosoma, and metasoma. The inner margins of the compound eyes convergent above and the males with a very strongly developed genal ridge link this species closely with *A. chromotricha.*

SPECIES REMOVED FROM *CNEMIDANDRENA*

Andrena antonitonis Viereck and Cockerell, 1914, Proc. U.S. Natl. Mus. 48:56-57, female. This species was included in *Cnemidandrena* by Lanham (1949). The pronotum is without a ridge, and the humeral angle is very poorly developed. The propodeal corbicula has hairs throughout the posterior dorsal half. The position of this species is uncertain.

Andrena autumnalis Viereck and Cockerell, 1914, Proc. U.S. Natl. Mus. 48:44, female. This species was included in *Cnemidandrena* by Lanham (1949). I have not seen the holotype which is in the collection of the University of Nebraska, or any specimens identified as this species. The description states in part "middle femora very sharply keeled beneath," a character which is incompatible with *Cnemidandrena.* The position of this species is uncertain.

Andrena davidsoni Viereck and Cockerell, 1914, Proc. U.S. Natl. Mus. 48:52 female. This species was provisionally assigned to *Cnemidandrena* by Lanham (1949). The holotype female which is in the University of Colorado Museum was not available to me and there were no specimens identified as this species in the material I examined. The description states in part "Process of labrum truncate, the truncation slightly concave", and "Facial foveae . . . extremely narrow." Without examining the holotype, I cannot be absolutely sure that it is not a *Cnemidandrena* on the basis of the above characters, but if these characters are as described, the specimen probably does not belong in *Cnemidandrena.* Of uncertain position.

Andrena pacta Viereck, 1963, Trans. Am. Entomol. Soc. 43:54 female, male. This species was provisionally assigned to *Cnemidandrena* by Lanham (1949). The pronotum is rounded, not angulate, a character which at once separates this species from *Cnemidandrena.* Affinities uncertain.

Andrena segregans Cockerell, 1900, Ann. Mag. Nat. Hist. (7)5:404 female, male. This species was provisionally assigned to *Cnemidandrena* by Lanham (1949), but the pronotum is without a humeral angle or ridge and in the female the propodeal corbicula has hairs throughout. LaBerge (pers. comm.) assigns this species to the subgenus *Geandrena* LaBerge.

APPENDIX

List of Flower Records

Flowers visited by *Cnemidandrena* with the bees listed by sex and the type of visit made by females; N = Nectar, P = Pollen.

BORAGINACEAE

Mertensia lanceolata: A. apacheorum, female, N.

CAPPARIDACEAE

Cleome sp.: *A. canadensis,* female, N; *A. nubecula,* female, N.

C. serrulata: A. apacheorum, female, P,N; *A. columbiana,* male.

COMPOSITAE

Anthemideae

Achillea millefolium: A. columbiana, female, P,N; *A. costillensis,* female, P,N; *A. surda,* female, N.

Tanacetum vulgare: A. chromotricha, female, P,N.

Astereae

Aster sp.: *A. apacheorum,* female, N; *A. canadensis,* female, P,N; *A. colletina,* female, P; *A. costillensis,* female, P,N, male; *A. nubecula,* female, P,N; *A. scutellinitens,* female, P,N; *A. surda,* female, P,N; *A. xanthigera,* female, P,N, male.

A. ericoides: A. nubecula, female, N.

A. foliaceus: A. scutellinitens, female, P,N.

A. multiflorus: A. canadensis, female, P,N; *A. nubecula,* female, N.

A. umbellatus: A. nubecula, female, P,N.

Baccharis emoryi: A. aurihirta, female, P,N, male.

Bigelovia graveolens: A. apacheorum, female, N.

Chrysothamnus sp.: *A. aurihirta,* male; *A. bendensis,* female, P; *A. bocensis,* female, P,N, male; *A. canadensis,* male; *A. colletina,* female, P,N, male; *A. costillensis,* female, P,N; *A. luteihirta,* female, P,N; *A. nubecula,* female, N; *A. ramaleyi,* female, P,N, male; *A. scutellinitens,* female, P,N, male; *A. sulcata,* female, P,N, male; *A. surda,* female, N, male.

C. graveolens: A. colletina, female, P.

C. nauseosus: A. aurihirta, female, P,N, male; *A. luteihirta,* female, P,N; *A. nubecula* female, N; *A. ramaleyi,* female, P; *A. surda,* female, N.

C. n. consimilis: A. aurihirta, female, N, male; *A. bendensis,* female, P; *A. colletina,* female, P,N, male.

C. n. graveolens: A. apacheorum, female, N.

C. n. mohavensis: A. aurihirta, male.

C. n. occidentalis: A. aurihirta, female, P,N; *A. luteihirta,* female, P,N.

C. n. speciosus: A. bocensis, female, P,N, male; *A. scutellinitens,* female, P,N, male.

C. n. typicus: A. bocensis, female, N.

C. parryi: A. aurihirta, female, P,N, male; *A. luteihirta,* female, P,N.

C. pumilis: A. aurihirta, female, P,N, male.

C. viridulus: A. aurihirta, female, P,N, male.

C. viscidiflorus stenophyllus: A. colletina, female, P,N, male.

C. v. typicus: A. bendensis, female, P; *A. colletina,* female, P; *A. scutellinitens,* female, N; *A. surda,* male.

Erigeron sp.: *A. apacheorum,* female, P,N; *A. aurihirta,* male; *A. columbiana,* male; *A. costillensis,* female, P,N, male; *A. surda,* female, P,N.

E. macranthus: A. chromotricha, female, P,N.

E. nevadensis pygmaea: A. columbiana, male.

Euthamia graminifolia: A. hirticincta, female, P,N; *A. nubecula.* male.
Grindelia sp.: *A. colletina,* female, P; *A. columbiana,* female. P,N; *A. costillensis,* female, P,N; *A. grindeliae,* female, P,N; *A. hirticincta,* female, P,N; *A. nubecula,* female, P,N; *A. surda,* female, P,N.
G. camporum: A. luteihirta, female, P,N.
G. squarrosa: A. canadensis, female, P,N; *A. chromotricha,* female, P,N; *A. hirticincta,* female, P,N.
Gutierrezia californica: A. aurihirta, male; *A. luteihirta,* female, N.
G. sarothrae: A. aurihirta, female, N, male; *A. canadensis,* male; *A. costillensis,* female, P,N; *A. hirticincta,* male; *A. ramaleyi,* female, P,N; *A. xanthigera,* female, P,N.
Haplopappus sp.: *A. columbiana,* female, N; *A. pachucensis,* female, P,N; *A. surda,* female, P,N.
H. bloomeri angustatus: A. colletina, female, P,N, male; *A. scutellinitens,* female, P,N, male.
H. suffluticosa: A. columbiana, female, N.
Heterotheca sp.: *A. aurihirta,* male; *A. costillensis,* female, P,N.
H. grandiflora: A. citrinihirta, female, P,N.
H. venetus vernonioides: A. aurihirta, female, P,N, male.
Machaeranthera varians: A. columbiana, female, P,N.
Solidago sp.: *A. aurihirta,* male; *A. canadensis,* female, P,N, male; *A. citrinihirta,* female, P,N, male; *A. colletina,* female, P,N, male; *A. columbiana,* female, P,N; *A. hirticincta,* female, P,N, male; *A. luteihirta,* female, P,N; *A. nubecula,* female, P,N, male; *A. peckhami; A. scutellinitens,* female, P,N, male; *A. surda,* female, P,N, male.
S. affinis: A. aurihirta, male.
S. altissima: A. hirticincta, female, P,N; *A. nubecula,* female, P,N.
S. californica: A. aurihirta, female, N, male; *A. citrinihirta,* female, N, male; *A. luteihirta,* female, P,N.
S. canadensis: A. canadensis, female, P,N, male; *A. hirticincta,* female, P,N; *A. nubecula,* female, P,N, male; *A. xanthigera,* female, N.
S. confinis: A. luteihirta, female, P,N.
S. elongata: A. scutellinitens, female, P,N.
S. junua: A. nubecula, female, P,N.
S. mollis: A. hirticincta, female, P,N.
S. nemoralis: A. hirticincta, female, P,N; *A. nubecula,* female, P,N, male.
S. occidentalis: A. aurihirta, male; *A. citrinihirta,* female, P,N, male.
S. puberula: A. nubecula, female, P,N.
S. rigida: A. nubecula, female, P,N.
S. rugosa: A. canadensis, male; *A. hirticincta,* female, P,N.
S. vadula: A. hirticincta, female, N.

Cichorieae

Sonchus varensis: A. chromotricha, female, P,N; *A. peckhami,* female, P,N; *A. robervalensis,* female, P,N.
Taraxacum taraxacum: A. chromotricha, female, P,N.

Cynareae

Cirsium arvense: A. peckhami, female, P,N.

Eupatorieae

Eupatorium perfoliatum: A. hirticincta, male.

Heliantheae

Encelia farinosa: A. nubecula, female, N.
Helianthus sp.: *A. chromotricha,* female, P,N.
H. maximilliani: A. chromotricha, female, P,N.
H. tuberosa: A. chromotricha, female, P,N.
Hemizonia luzulaefolia: A. grindeliae, female, N.
Ratibida columnaris: A. chromotricha, female, P,N.
Rudbeckia laciniata: A. chromotricha, female, P,N, male.

Inuleae

Anaphalis sp.: *A. candensis,* male.

A. margaritacea: A. canadensis, male.

Senecioneae

Senecio sp.: *A. colletina,* male; *A. scutellinitens,* female, N.

S. ionophyllos: A. aurihirta, male.

S. risbyi: A. chromotricha, female, P,N.

CRUCIFERAE

Brassica campestris: A. robervalensis, female, N.

CUCURBITACEAE

Cucurbita sp.: *A. mentzeliae,* male.

GERANIACEAE

Geranium sp.: *A. apacheorum,* female, P,N.

IRIDACEAE

Iris missouriensis: A. apacheorum, male.

LEGUMINOSAE

Baptisia sp.: *A. peckhami.*

Medicago sp.: *A. canadensis,* male.

M. sativa: A. robervalensis, female, N.

Melilotus sp.: *A. columbiana,* male.

M. alba: A. bocensis, female, N; *A. chromotricha,* female, N; *A. robervalensis,* female, N; *A. surda,* male.

Trifolium procumbens: A. nubecula, male.

LOASACEAE

Mentzelia sp.: *A. mentzeliae,* female, P,N.

M. decapetala: A. mentzeliae, female, P,N.

M. multiflora: A. mentzeliae, female, P,N, male.

M. nuda: A. mentzeliae, female, P,N.

Touterea rusbyi: A. mentzeliae, male.

MALVACEAE

Gossypium sp.: *A. surda,* male.

ONAGRACEAE

Epilobium sp.: *A. hirticincta,* male.

PAPAVERACEAE

Argemone sp.: *A. latinensis,* male.

POLYGONACEAE

Eriogonum sp.: *A. grindeliae,* female, N; *A. luteihirta,* female, P,N, male.

E. californicus: A. luteihirta, female, P,N.

E. fasciculatum: A. luteihirta, female, P,N.

E. nudum: A. luteihirta, male.

Polygonum sp.: *A. surda,* male.

RANUNCULACEAE

Ranunculus sp.: *A. apacheorum,* female, N.

UMBELLIFERAE

Daucus carota: A. chromotricha, female, N.

Heracleum sp.: *A. columbiana,* female, N.

Oxypolis occidentalis: A. scutellinitens, female, N.

Pastinaca sp.: *A. apacheorum,* female, P,N.

Sphenosciadium capitellatum: A. columbiana, female, P,N; *A. surda,* female, P,N, male.

LITERATURE CITED

Papers cited only in the synonymy are not repeated below.

Brittain, W. H., and D. E. Newton
1934. Further observations on the pollen constancy of bees. Can. J. Res. 10:255-263.

Buckell, E. R.
1949. Record of bees from British Columbia (Andrenidae). Proc. Entomol. Soc. B. C. 45:28.

Cockerell, T. D. A.
1906. The bees of Florissant, Colorado. Am. Mus. Nat. Hist. Bull. 22:453-454.
1916. New and little known bees. Entomologist 49:157.
1931. Rocky Mountain Bees – II. Am. Mus. Novit. 458:1-20.

Dalla Torre, C. G. de
1896. Catalogus Hymenopterum 10: Apidae. 643 pp.

Graenicher, S.
1904. Wisconsin bees: Genus *Andrena*. Entomol. News 15:64-67.

Hedicke, H.
1933. Beiträge zur Systematik der Gattung *Andrena*. Mitt. Zool. Mus. Berl. 19:199-220.

Hicks, C. H.
1926. Nesting habits and parasites of certain bees of Boulder County, Colorado. Univ. Colo. Stud. Ser. Biol. 15:217-252.

Hirashima, Y.
1964. Systematic and biological studies of the family Andrenidae of Japan. Part 2. Systematics, 3. J. Fac. Agric. Kyushu Univ. 13:1, 39-69.
1966. Systematic and biological studies of the family Andrenidae of Japan. Part 2, Systematics, 7. J. Fac. Agric. Kyushu Univ. 14:1, 89-131.

Knerer, G., and C. E. Atwood
1964. An annotated check list of the genus *Andrena* in Ontario. Proc. Entomol. Soc. Ont. 94:41-56.

LaBerge, W. E.
1964. Prodromus of American bees of the genus *Andrena*. Univ. Nebr. State Mus. Bull. 4:279-316.
1967. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part I. *Callandrena*. Univ. Nebr. State Mus. Bull. 7:1-316.
1969. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part II. *Plastandrena, Aporandrena, Charitandrena*. Trans. Am. Entomol. Soc. 95:1-47.
1971*a*. A new subgenus of *Andrena* found in California and Oregon. (Hymenoptera: Apoidea). Pan-Pac. Entomol. 47:1, 47-57.
1971*b*. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part IV. *Scrapteropsis, Xiphandrena* and *Rhaphandrena*. Trans. Am. Entomol. Soc. 97:441-520.
1973. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part VI. Subgenus *Trachandrena*. Trans. Am. Entomol. Soc. 99:235-371.

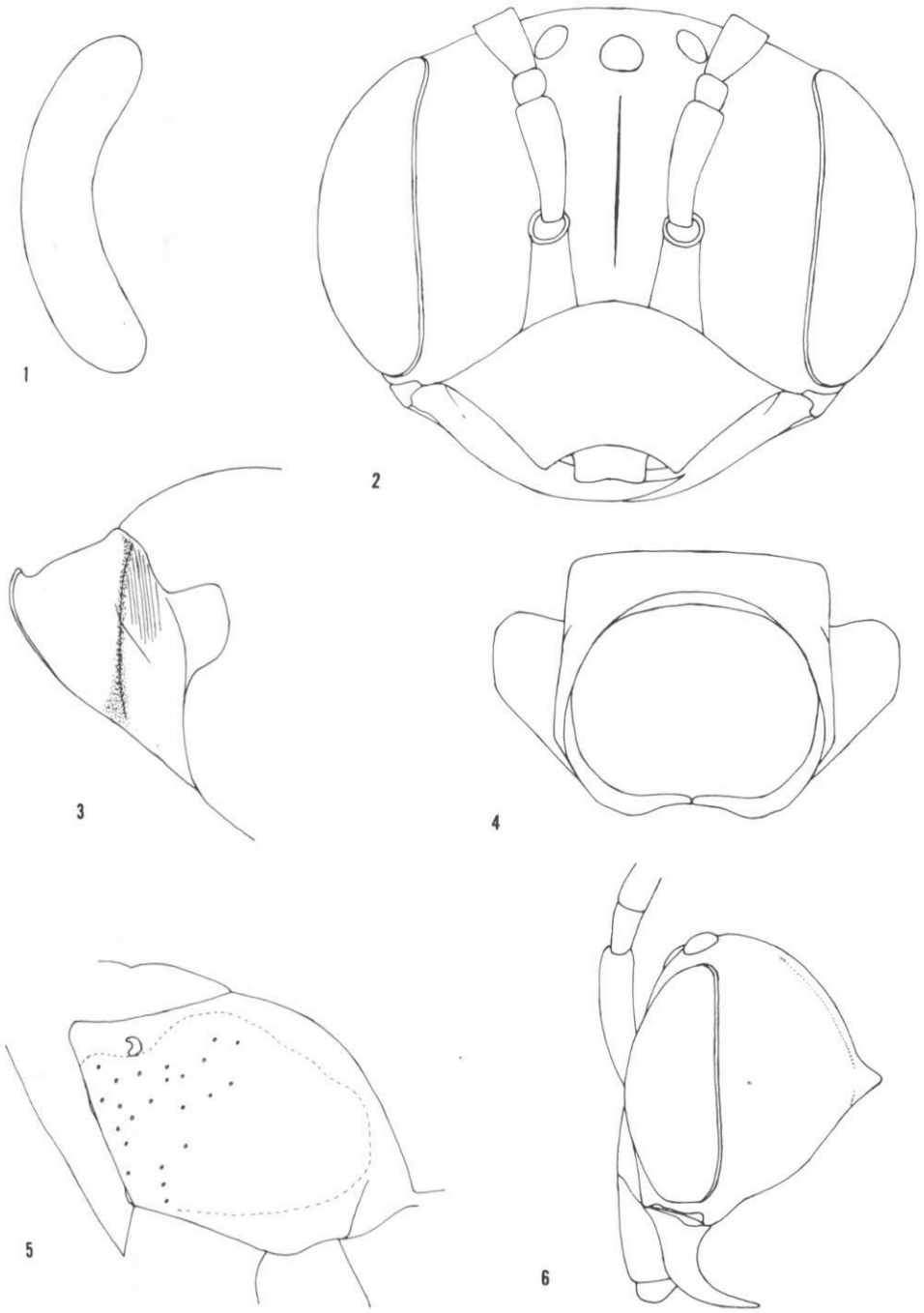
LaBerge, W. E., and J. K. Bouseman
1970. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part III. *Tylandrena*. Trans. Am. Entomol. Soc. 96:543-605.

LaBerge, W. E., and D. W. Ribble
1972. A revision of the bees of the genus *Andrena* of the Western Hemisphere. Part V. *Gonandrena, Geissandrena, Parandrena, Pelicandrena*. Trans. Am. Entomol. Soc. 98:271-358.

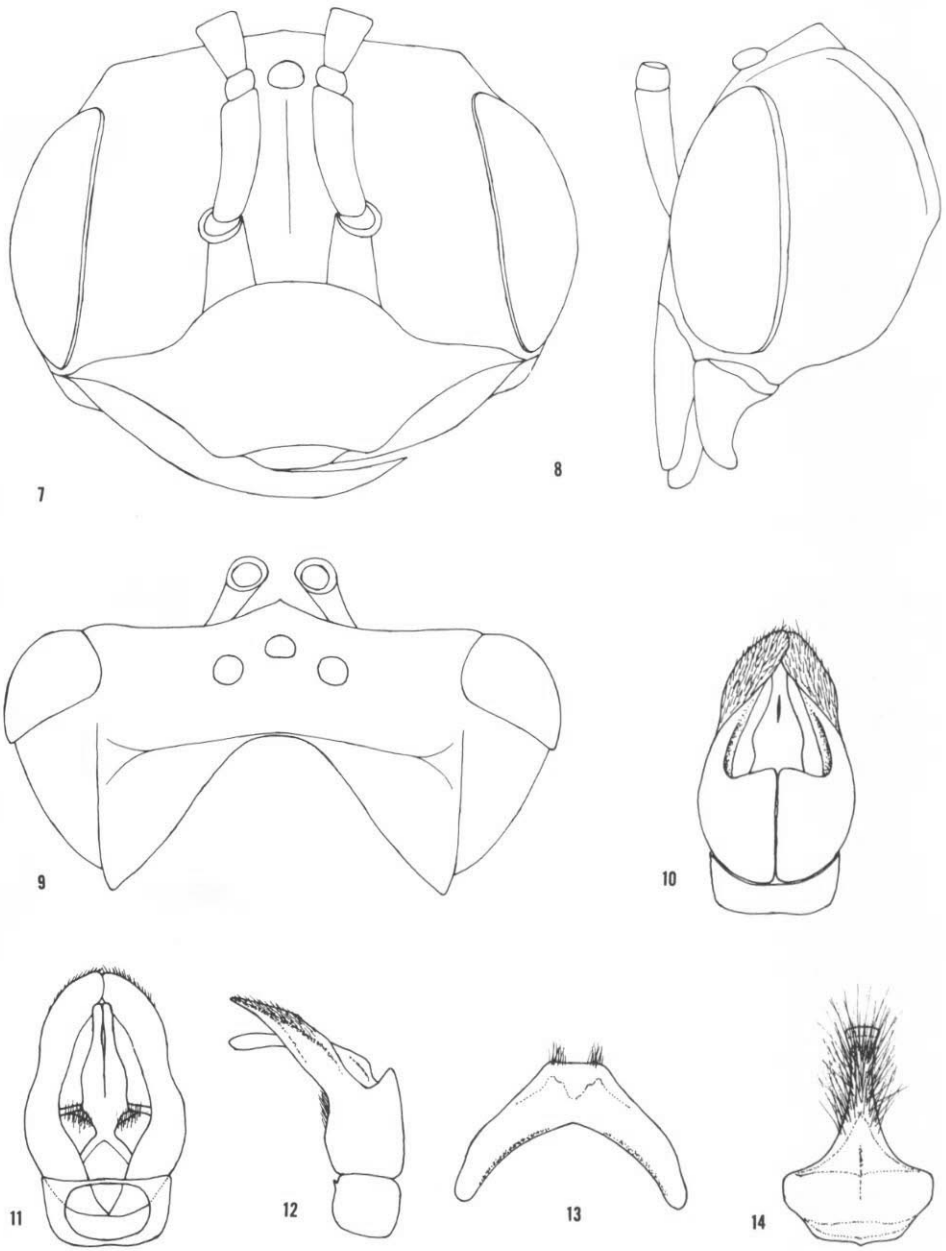
Lanham, U. N.
1949. A subgeneric classification of the New World bees of the genus *Andrena*. Univ. Calif. Publ. Entomol. 8:183-237.

Michener, C. D.
1944. Comparative external morphology, phylogeny, and a classification of the bees. Am. Mus. Nat. Hist. Bull. 82:151-326.
Mitchell, T. B.
1960. Bees of the eastern United States, I.N.C., Agric. Exp. Stn. Tech. Bull. 141: 1-538,
Perez, J.
1890. Catalogue des Melliferes du sud-ouest. Acta Soc. Linn. Bordeaux 44:133-200.
Perkins, R. C. L.
1918. Further notes of stylops and stylopized bees. Entomol. Mon. Mag. 54:115-131.
1919. The British species of *Andrena* and *Nomada.* Trans. Entomol. Soc. Lond. 1919, I, II (July):218-319.
Provancher, L'Abbe L.
1888. Additions et corrections au Volume II de la faune entomologique du Canada (Quebec). 475 pp.
Ribble, D. W.
1968*a*. A new subgenus *Belandrena* of the genus *Andrena.* J. Kans. Entomol. Soc. 41:2, 220-236.
1968*b*. Revisions of two subgenera of *Andrena: Micrandrena* Ashmead and *Derandrena,* new subgenus. Univ. Nebr. State Mus. Bull. 8:5, 237-394.
Robertson, C.
1902. Synopsis of Andreninae. Trans. Am. Entomol. Soc. 28:187-194.
Rozen, J. G., Jr.
1951. A preliminary comparative study of the male genitalia of the Andrenidae. J. Kans. Entomol. Soc. 24:142-150.
Salt, G.
1927. The effects of stylopization on aculeate Hymenoptera. J. Exp. Zool. 48:223-331.
Smith, F.
1853. Catalogue of hymenopterous insects in the collection of the British Museum, I. 197 pp.
Stockert, E.
1930. *In* Schmiedeknecht et al. Die Hymenopteren Nord- und Mitteleuropas mit Einschluss von England, Sudschweiz, Sudtirol, und Ungarn nach ihren Gattung und zum grossen Teil auch nach ihren Arten analytisch bearbeitet. Jena 1062 pp.
Thorp, R. W.
1969. Systematics and ecology of bees of the subgenus *Diandrena.* Univ. Calif. Publ. Entomol. 52:1-146.
Warncke, K.
1968. Die Untergattungen der westpalaarttischen Bienengattung *Andrena* F. Mem. Estud. Mus. Zool. Univ. Coimbra 307:1-110.

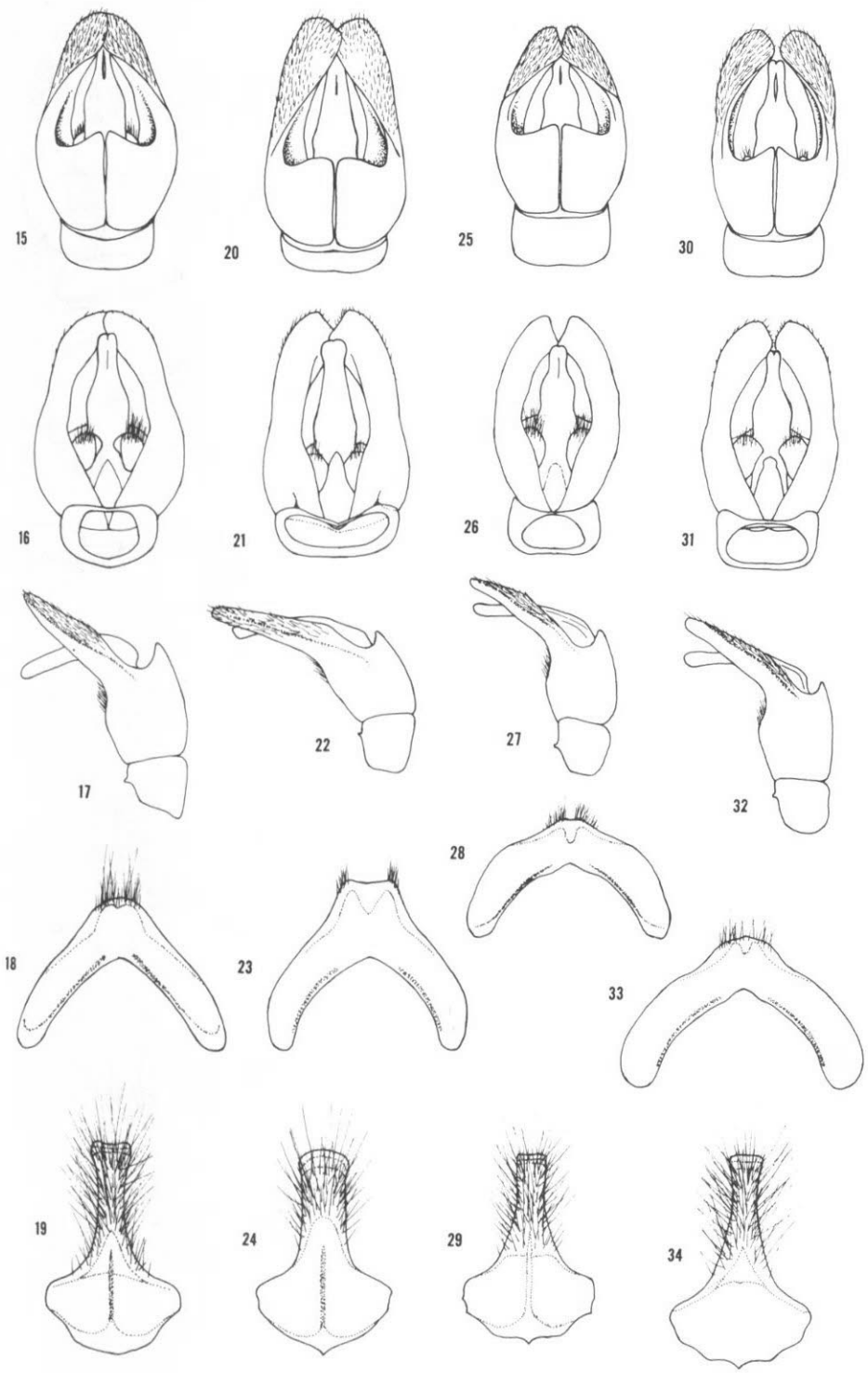
FIGURES AND MAPS



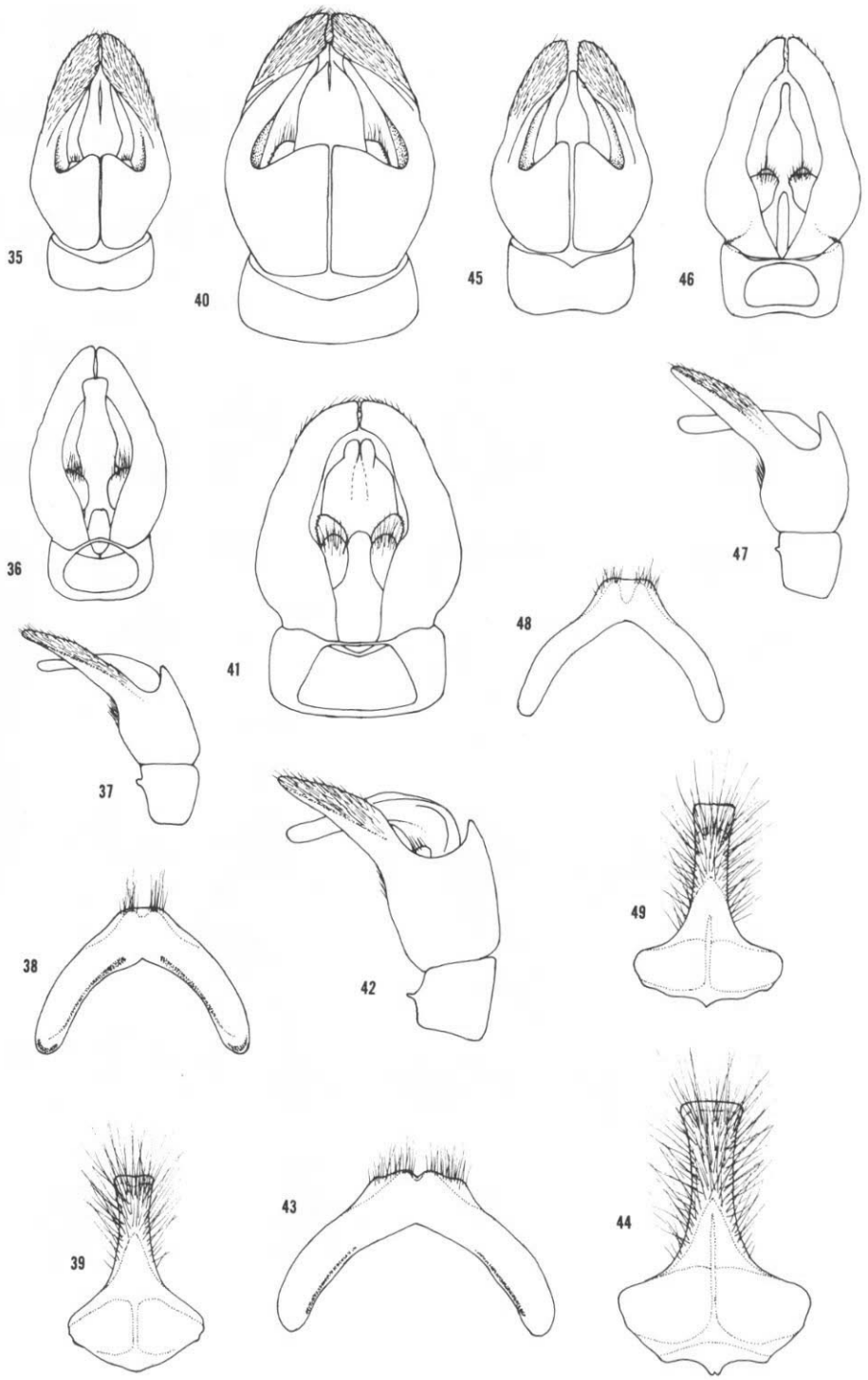
Figs. 1-6. 1. Egg dissected from *Andrena surda.* 2. Anterior view of head of male *A. aurihirta,* showing the inner margins of the compound eyes diverging above except for the upper ends incurved. 3. Pronotum of male *A. nubecula,* lateral view, showing humeral ridge and pronotal suture. 4. Pronotum of male *A. nubecula,* anterior view, showing humeral angle and ridge and the upper end of the pronotal suture. 5. Propodeum of female *A. scutellinitens,* lateral view, showing the outline of the propodeal corbicula and the distribution of hairs in the anterior region. 6. Head of male *A. xanthigera,* lateral view, showing the well-developed posterior genal projection.



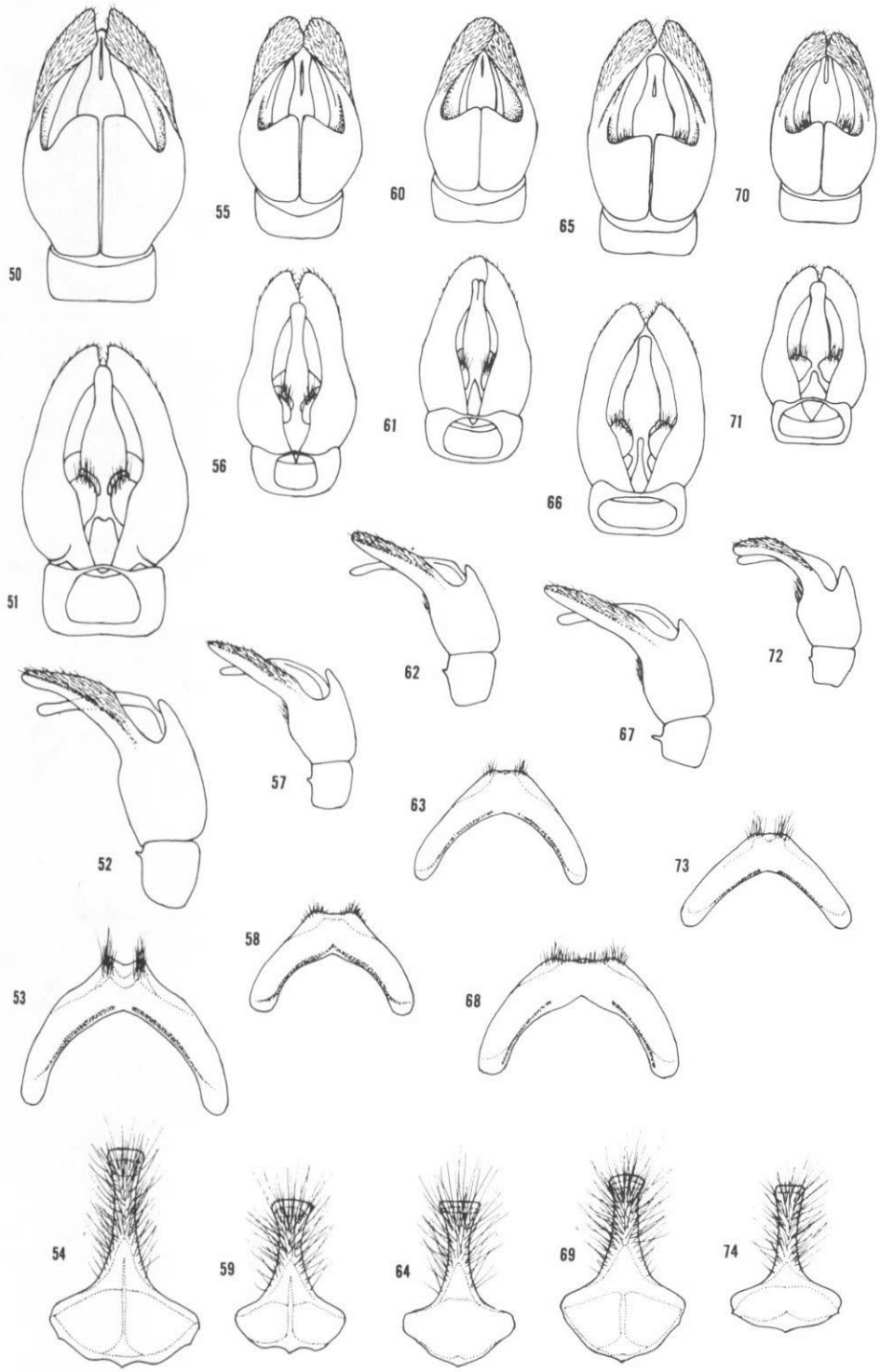
Figs. 7-14. 7. Head of male *Andrena chromotricha,* anterior view, showing the inner margins of the compound eyes converging above. 8. Head of male *A. chromotricha,* lateral view, showing the well-developed genal ridge. 9. Head of male *A. chromotricha,* dorsal view, showing the well-developed genal ridge. 10-14. Genital capsule and sterna 7 and 8 of *A. apacheorum.*



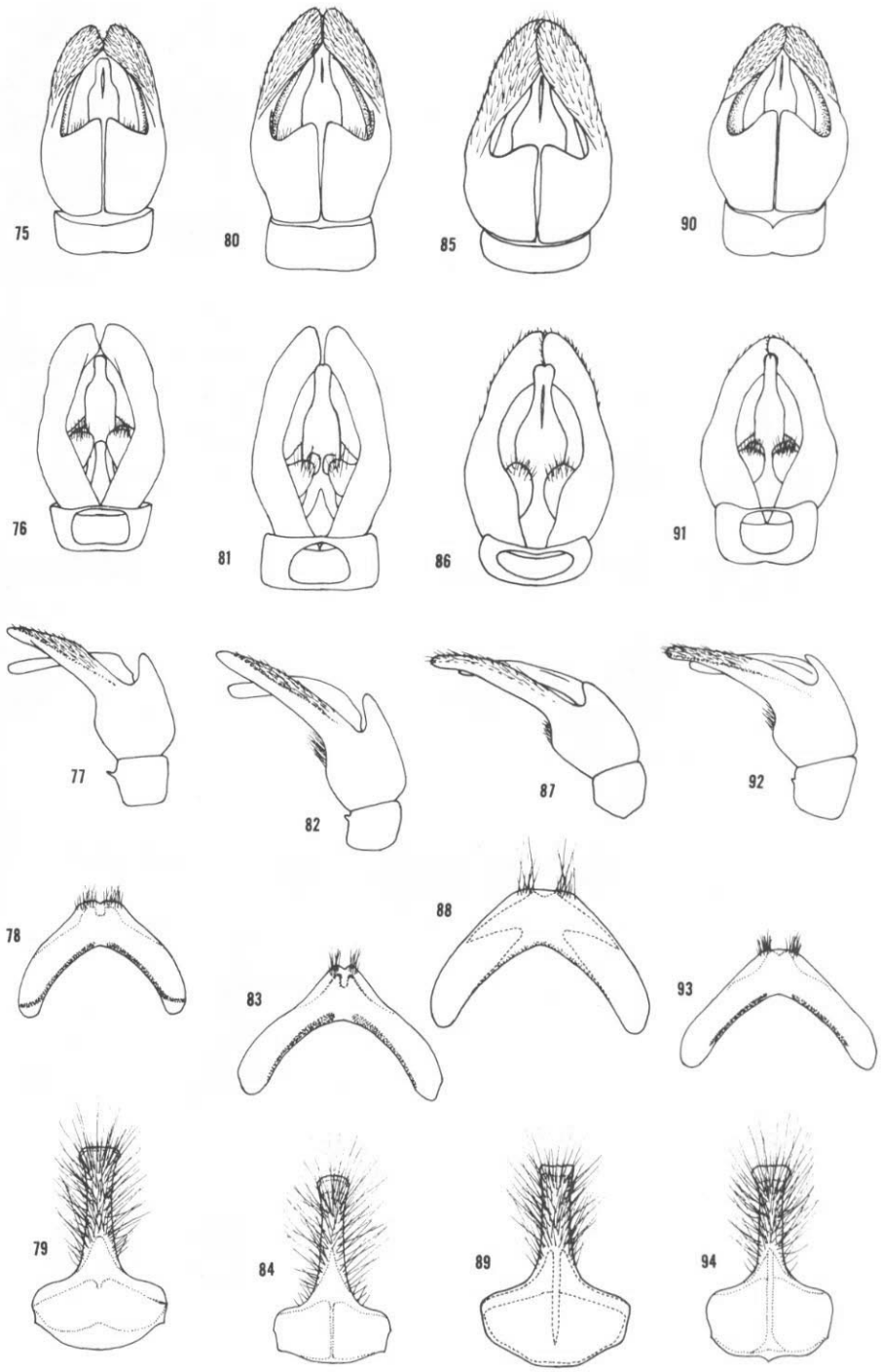
Figs. 15-34. Genital capsule and sterna 7 and 8 of the following: *A. latinensis* (15-19), *A. rodilla* (20 to 24), *A. costillensis* (25 to 29), and *A. columbiana* (30 to 34).



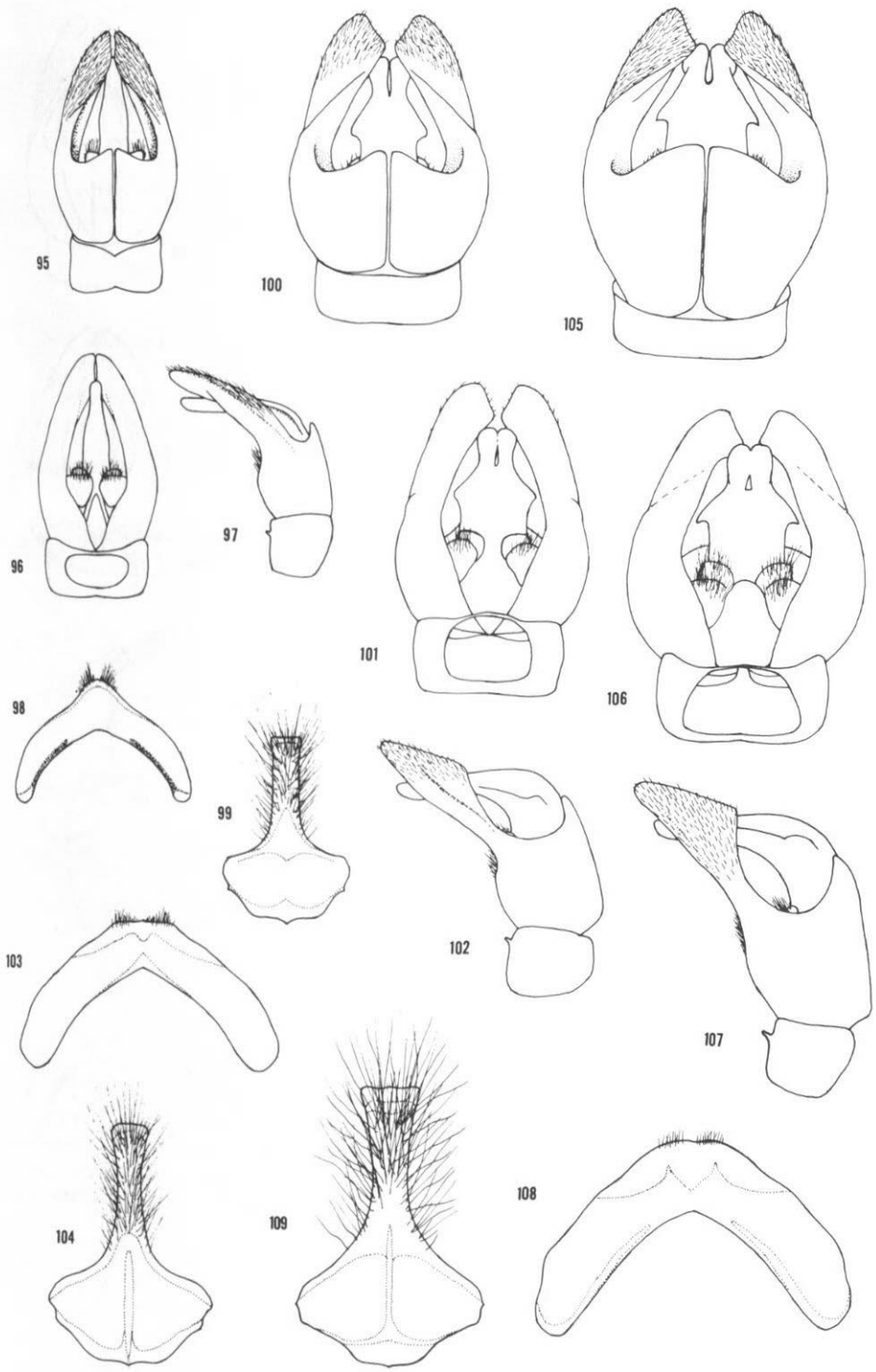
Figs. 35-49. Genital capsules and sterna 7 and 8 of the following: *A. pachucensis* (35 to 39), *A. mentzeliae* (40 to 44), and *A. scutellinitens* (45 to 49).



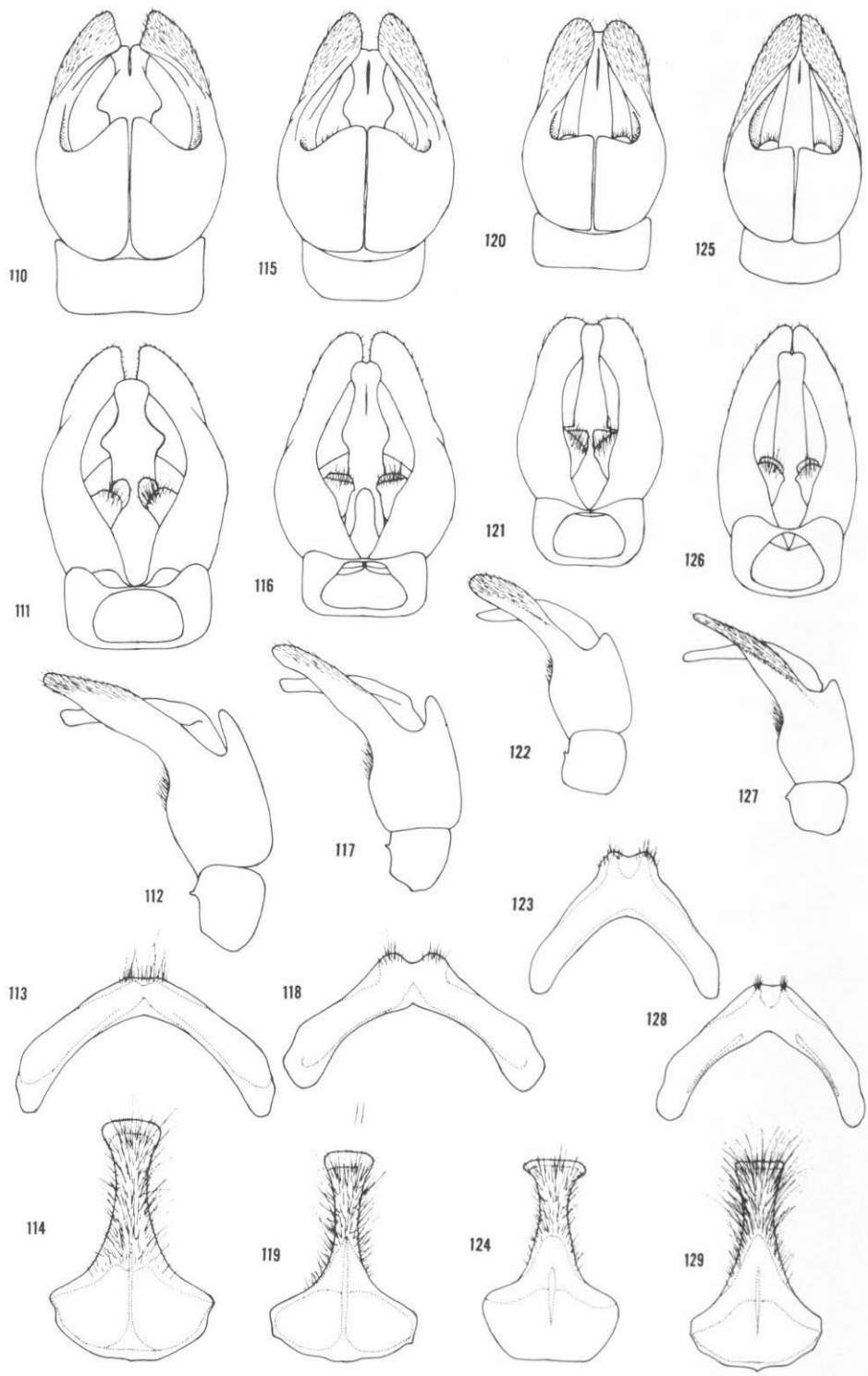
Figs. 50-74. Genital capsules and sterna 7 and 8 of the following: *A. robervalensis* (50 to 54), *A. nubecula* (55 to 59), *A. xanthigera* (60 to 64), *A. canadensis* (65 to 69), and *A. bocensis* (70 to 74).



Figs. 75-94. Genital capsules and sterna 7 and 8 of the following: *A. citrinihirta* (75 to 79), *A. aurihirta* (80 to 84), *A. ramaleyi* (85 to 89), and *A. bendensis* (90 to 94).



Figs. 95-109. Genital capsules and sterna 7 and 8 of the following: *A. sulcata* (95 to 99), *A. hirticincta* (100 to 104), and *A. colletina* (105 to 109).



Figs. 110-129. Genital capsules and sterna 7 and 8 of the following: *A. surda* (110 to 114), *A. luteihirta* (115 to 119), *A. chromotricha* (120 to 124), and *A. peckhami* (125 to 129).

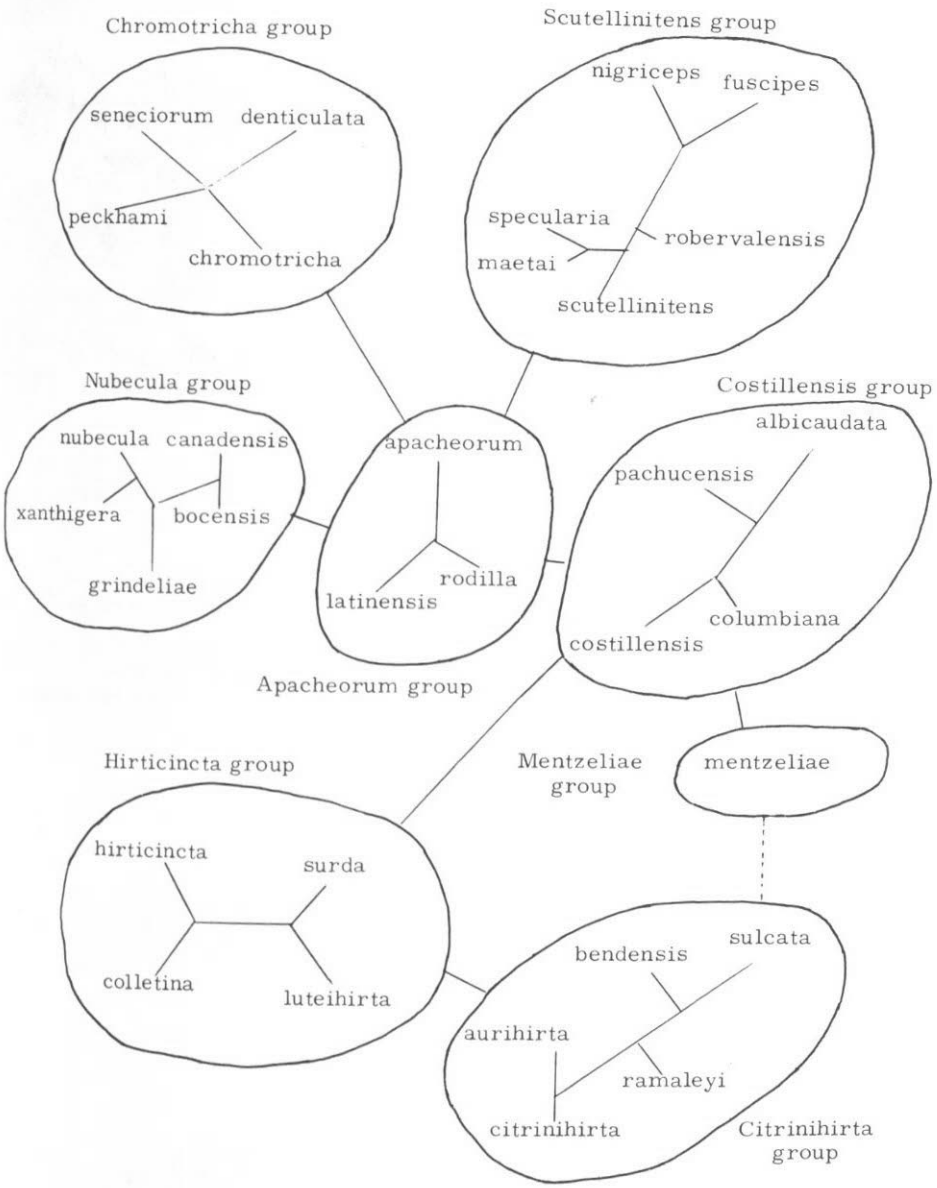
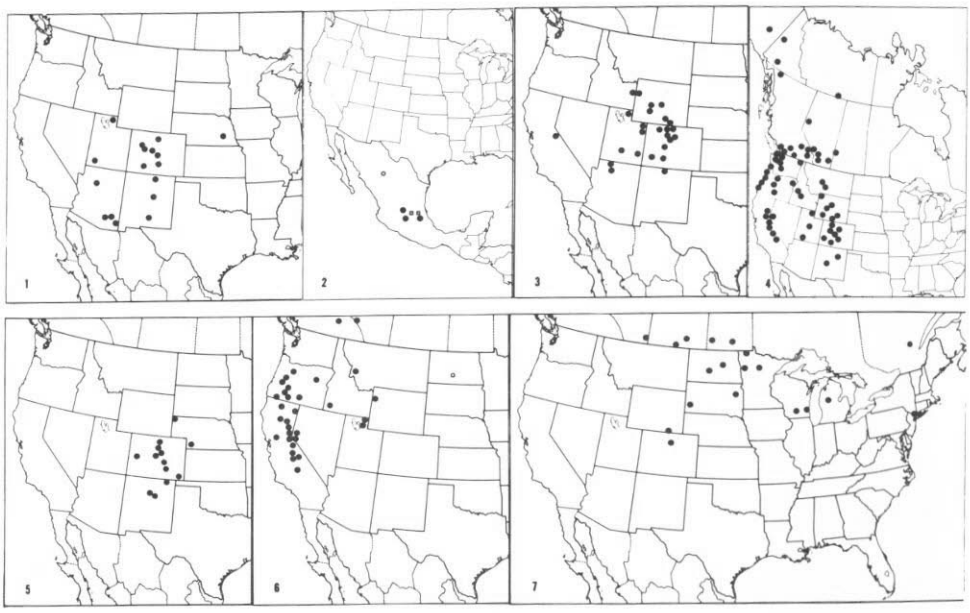
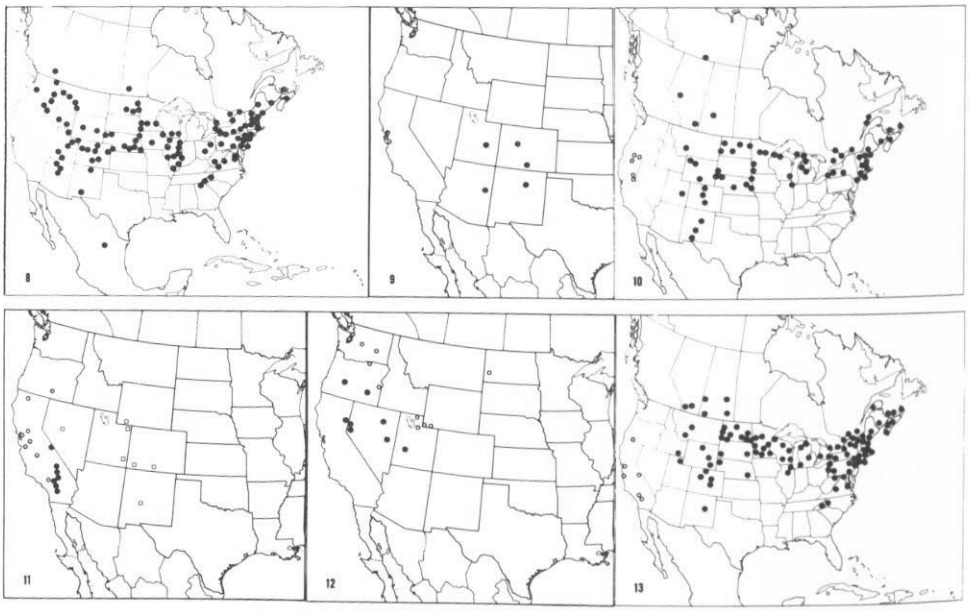


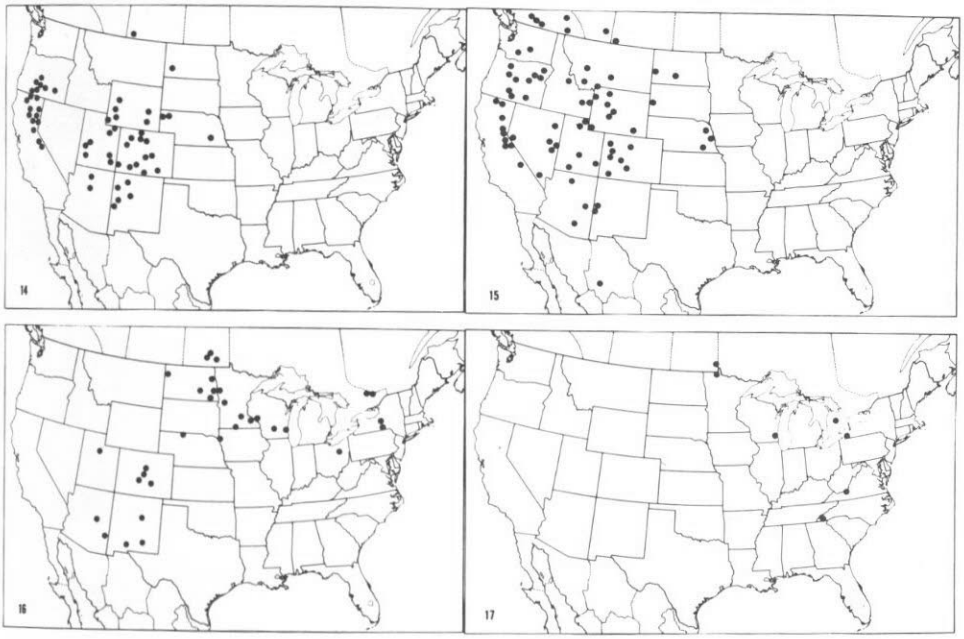
Fig. 130. Diagram of suggested evolutionary relationships among species and species groups in the subgenus *Cnemidandrena*. Three European and three Japanese species are included. Length and attitude of the lines, and spatial array of the groups indicate distance of relationships. The dotted line indicates an obscure relationship.



Maps 1-7. Distribution of the following: 1. *Andrena apacheorum.* 2. *A. latinensis* (solid circles), *A. rodilla* (open circle), and *A. pachucensis* (open squares). 3. *A. costillensis.* 4. *A. columbiana.* 5. *A. mentzeliae.* 6. *A. scutellinitens* (solid circles), and *A. specularia* (open circle). 7. *A. robervalensis.*



Maps 8-13. Distribution of the following: 8. *A. nubecula.* 9. *A. xanthigera* (solid circles), and *A. grindeliae* (open circles). 10. *A. canadensis* (solid circles), and *A. bocensis* (open circles). 11. *A. citrinihirta* (open circles), *A. aurihirta* (solid circles), and *A. ramaleyi* (open squares). 12. *A. bendensis* (solid circles), and *A. sulcata* (open circles). 13. *A. hirticincta* (solid circles), and *A. luteihirta* (open circles).



Maps 14-17. Distribution of the following: 14. *A. colletina.* 15. *A. surda.* 16. *A. chromotricha.* 17. *A. peckhami.*