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New Species and Notes on Flies Belonging to the Genus *Apiocera* (Diptera, Apioceridae)

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ABSTRACT

Five new species are added to the North American *Apiocera* fauna bringing the total to 69 taxa, 63 species, and six subspecies. Revised keys to the species are presented as are descriptions of several previously unknown females, i.e., *augur*, *alleni*, *exta*, and *voragocolis*. The status of Osten Sack-

en's Mexican *augur* is clarified, more definite locations for *exta* are made known, and the distribution of *voragocolis* is extended out of the gorge of the Grand Canyon. The new species are: *Apiocera mulegeae*, *warneri*, *varia*, *constricta*, and *lavignei*.

INTRODUCTION

During the period when my 1982 revision of the genus *Apiocera* was in press and thus unavailable for change, several new species represented by male specimens were found in material submitted for identification, i.e., *constricta* and *mulegeae*. After the paper was published, additional new species were found, i.e., *warneri* and *varia*. The previously unknown females of certain species have been added to the descriptions, i.e., *augur*, *voragocolis*, and *exta*; these plus two others, i.e., *alleni* and *varia*, have been included in the new key to the females of *Apiocera*. The confused status and identity of Osten Sacken's Mexican species, *augur*, is considered in the

light of a recently acquired topotype and additional material of that species. This revised understanding of *augur* has required the description of *lavignei*, new species, which I mistakenly identified as *augur* in 1982.

Speculation concerning the exact location and distribution of *exta*, which was originally described from a single male taken in the Panamint Mountains, Inyo County, California has been stabilized with the finding of the species in two localities at the northern end of Death Valley and the Panamint Mountains. Similarly, the known distribution of *voragocolis*, described originally from two locations within the gorge of the Grand Canyon

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of the Colorado River, has been expanded by finding the species in two locations outside the canyon along the Virgin River in Northern Arizona and southwestern Utah. This river is a tributary of the Colorado River and this type of distributional pattern is known in other groups of animals.

As is so often the case, use of the key and new material or specimens from new locations will often alter or even negate the best intended postulations and interpretations of systematic data. Such is the case in several sections of my 1982 key to the males of *Apiocera*. Minor alterations have been required in several sections as additional specimens became available and major alterations had to be made to accommodate the five new species herein described. Thus, a revised key to the males is presented and the female key, with a few additions and minor changes, is included. In the key to the males, I have received permission to use many of the illustrations from the 1982 publication which, of course, greatly enhances its usability. However, in questionable unillustrated cases the reader is referred to Cazier, 1982, pp. 450–460.

ABBREVIATIONS FOR INSTITUTIONS HOUSING MATERIAL USED IN THIS PAPER:

AMNH, American Museum of Natural History,
New York
LACM, Los Angeles County Museum, California
MAC, Mont A. Cazier, Tempe, Arizona
UK, University of Kansas, Lawrence, Kansas

ACKNOWLEDGMENTS

The publication of the "Revision of the North American flies belonging to the genus *Apiocera*" in 1982 has evidently stimulated an interest in this unusual group of flies in both seasoned and newly inspired insect collectors. The contents of the present paper are largely a result of this enthusiastic trend which I hope will continue and to which I hope I can contribute. I am especially indebted and express my gratitude to Dr. Frank F. Hasbrouck, curator in charge of the Arizona State University collection, for continuing to allow me unrestricted use of the *Apioceridae* in this fine collection. My thanks and appreciation are also extended to Drs. Lee H. Herman, Jr., Curator, and R. T. Schuh, Chairman and Cu-

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Special thanks are extended to Mrs. Marjorie Favreau, Scientific Assistant Emeritus, Department of Entomology, American Museum of Natural History, for making the drawings of the new species and aiding in the adaptation of old drawings to the revised key. I am indebted to the following individuals for supplying much new material for identification and for specific contributions that greatly enhanced the value of this treatment. Dr. R. C. Bechtel, Reno, Nevada was responsible for my being able, through Dr. Frank D. Parker, Logan, Utah, to examine and identify the fine collection of *Apioceridae* in the Utah State University collection, in which were found specimens of the uncommon *voragocolis* from two new locations outside Grand Canyon. Eric M. Fisher, Sacramento, California, gave me two specimens of a new species from Baja California Sur, Mexico, herein described as *mulegeae*. A third specimen of *mulegeae* was supplied by Roy R. Snelling, Los Angeles County Natural History Museum, California. The specific whereabouts of the enigmatic *exta* were finally settled through the receipt of specimens from two locations in Death Valley submitted by Ms. Catherine A. Toft, University of California, Davis. In the extensive collection received for identification from David K. Faulkner, San Diego Museum of Natural History, California there were three males of *powelli*, which was known previously only by the unique type.

A significant contribution was received from Arthur V. Evans, Long Beach, California; he supplied a "topotype" and other specimens of Osten Sacken's misunderstood *augur*, making it possible to redescribe the male and describe the female for the first time. This new information required a change in the status of a specimen previously thought to be *augur*, supplied by Dr. Robert Lavigne, University of Wyoming, Laramie, herein described as new and named in honor of its collector, Dr. Lavigne. Dr. E. I. Schlinger, University of California, Berkeley, made available a single specimen of a new species herein described as *constricta*. A mildly an-

noying feature of this species is that it was collected in an area previously collected many times by me and many students. Other species were found but not *constricta*.

A series of ten male specimens of a new species was received from Dr. George W. Byers, Snow Entomological Museum, University of Kansas, Lawrence, and is herein named *varia*. Considerable help was received from Dr. Paul Arnaud, Jr., California Academy of Sciences, San Francisco, not only in supplying material but more importantly in allowing the writer to retain type material temporarily until the completion of this study. Last but not least to my esteemed colleague W. (Bill) B. Warner, I owe special consideration for the new species, herein named *warneri*, which disrupted the 1982 key to the males of *Apiocera* beginning with dichotomy two.

My sincere thanks and appreciation are again gratefully extended to Mrs. Nancy Meffe who has suffered uncomplainingly through the original typing, correcting, and final draft of yet another of my efforts toward fame. Her smiling perserverance is an outstanding quality.

KEY TO *APIOCERA* MALES

- 1. Terminalia closed ventrally; inner margin of each dististyle with a single postmedian oblique or transverse incision or tuft of transverse hair in this position, inner margins posterior to incisions apposed or narrowly and irregularly separated ventrally when closed; posterior margin of ninth abdominal sternite, usually exclusive of median posterior projection, with long, dense, or sparse recumbent pile extending posteriorly to or beyond postmedian incisions in dististyle margins (see fig. 1) 2
- Terminalia open ventrally; inner margin of each dististyle without postmedian incisions or tufts of transverse hair in this position, inner margins posterior to incisions not apposed, narrowly or widely separated ventrally when closed; posterior margin of ninth abdominal sternite, usually exclusive of median posterior projection, without long recumbent pile (see fig. 2) 33
- 2. Inner dististyle margins with postmedian

- incisions transverse or nearly absent (see fig. 1) 3
- Inner dististyle margins with postmedian incisions extending obliquely inward and posteriorly *wilcoxi*
- 3. Locking folds on inner hemitergite surface bare or with a few scattered short hairs or with a tuft of 6 to 30 hairs midbasally near or on the junction of the locking fold with the hemitergite surface . . . 4
- Locking folds on inner hemitergite surface with surface densely clothed with short erect bristlelike hairs over half or more than half of the surface (fig. 11) . . . 23
- 4. Proctiger with apex divided into an inverted Y-shape, lateral arms widely divergent (fig. 3); inner hemitergite surface without prominent hairs . . . *foleyi*
- Proctiger with apex not divided into an inverted Y-shape (fig. 4); inner hemitergite surface glabrous or with large or small tuft or row of short erect black hairs, usually medially on or near base of locking folds 5
- 5. Ventral claspette margin with some of the median golden hairs long, curved downward and inward beneath the proctiger and aedeagus viewed from posterior 6
- Ventral claspette margin glabrous or with all median golden hairs short, arranged fanlike, or evenly spaced along edge, not extending beneath the proctiger and aedeagus (fig. 5). Viewed laterally . . . 7
- 6. Dark abdominal transverse vittae on tergites 3 and 4 continuous, not completely interrupted dorsolaterally . . . *notata*
- Dark abdominal transverse vittae on tergites 3 and/or 4 interrupted dorsolaterally by longitudinal gray or white vittae *convergens*
- 7(5). Claspettes with ventral subapical lobes absent, short, wide, and/or inconspicuous, exclusive of hairs 8
- Claspettes with ventral subapical lobes long or medium in length, narrow, and conspicuous, exclusive of hairs 11
- 8. Proctiger with posterior margins of lateral apical projections evenly rounded outward, downward, and anteriorly, margin and surface smooth (fig. 6) 9
- Proctiger with posterior margins of lateral apical projections irregularly emarginate, margin and surface rough (fig. 7) 10
- 9. Proctiger broadly explanate dorsally anterior to middorsal apical opening, lateral apical extensions narrow, ventral

- posterior projections absent or inconspicuous (fig. 6); compound eyes separated from the lateral ocelli on the vertex by half or less than half the width of a lateral ocellus *horticolis*
- Proctiger constricted dorsally anterior to middorsal apical opening, lateral apical extensions broad, ventral posterior projections prominent (fig. 8); compound eyes separated from the lateral ocelli on the vertex by more than half the width of a lateral ocellus *varia*
10. Mesonotal marginal macrochaetae usually black; costal wing vein primarily black pilose basally; posterior head surface usually black and white macrochaetose dorsally *chrysolasia*
- Mesonotal marginal macrochaetae usually white; costal wing vein primarily white pilose basally; posterior head surface white macrochaetose dorsally *ogradyi*
- 11(7). Ventral subapical claspette lobes with long, curved, usually black or golden hair along outer margin; hemitergite locking folds not extending to or beyond ventral or posterior hemitergite margins 12
- Ventral subapical claspette lobes with only a basal tuft of long black or golden hair; hemitergite locking folds extending to or usually beyond ventral and/or posterior hemitergite margins *barri*
12. Proctiger not prominently extending dorsally and posteriorly beyond apices of middorsal apical opening, apices without dorsal acute projections 13
- Proctiger with prominent posterior extensions beyond apices of middorsal apical opening, apices with dorsal projections, usually acute 15
13. Abdominal transverse dark markings on tergites 3 and 4 partially or completely interrupted dorsolaterally by white or gray longitudinal vittae; proctiger with dorsolateral margins usually subparallel from middle to middorsal apical opening *bibula*
- Abdominal transverse dark markings on tergites 3 and 4 not interrupted dorsolaterally; proctiger with dorsolateral margins not subparallel 14
14. Proctiger with dorsolateral margins explanate subapically; claspettes with ventral subapical lobes sparsely short white pilose except for sparse long black hairs along outer margin especially toward base; costal wing vein black pilose *volucra*
- Proctiger with dorsolateral margins gradually explanate toward base, strongly constricted subapically (fig. 9); claspettes with ventral subapical lobes with dense long golden pilose obscuring lobes; costal wing vein white pilose in basal third *constricta*
- 15(12). Proctiger with upper edge of posterior extensions continuous with dorsal spines, extending gradually downward and posteriorly on each side of aedeagus; proctiger with dorsoapical opening narrow and elongate longitudinally; abdominal transverse dark vittae on tergites 3 and 4 usually partly or entirely infuscated 16
- Proctiger with posterior extensions arising from beneath dorsal spines, sharply biangulate downward and posteriorly; proctiger with dorsoapical opening wide, rounded, or broadly transverse; abdominal transverse dark vittae on tergites 3 and 4 black or brown, usually not infuscated 17
16. Anterior femora with outer margin entirely or primarily white macrochaetose; abdominal transverse dark vittae on tergites 3 and 4 usually broadly infuscated basally *parahydra*
- Anterior femora with outer margin entirely or primarily black macrochaetose; abdominal transverse dark vittae on tergites 3 and 4 not or only narrowly infuscated basally *mortensoni*
- 17(15). Proctiger with wide lateral shieldlike extensions arising from basal area of middorsal opening, extending outward at right angles to proctiger, downward and slightly anteriorly, margin deeply serrate dorsally and at ventral angle, shallowly serrate medially *fallax*
- Proctiger without wide lateral shieldlike extensions arising from the basal area of the middorsal opening 18
18. Dististyles piceous, elongate, gradually attenuated apically, terminating in a sharp point, densely black pilose along midrib in apical third. *acuticauda*
- Dististyles dark brown, abruptly or not attenuated, usually terminating in a rounded or blunt apex, sparsely black pilose along midrib in apical third 19
19. Abdominal tergite three with apical margin primarily white or tan pruinose, not or occasionally interrupted medially; claspettes with upper inner margin usually sparsely golden pilose . . . *sylvestris*

- Abdominal tergite three with apical margin entirely or primarily black; claspettes with upper inner margin moderately to densely clothed with golden pile 20
- 20. Head with posterior surface entirely or predominantly black macrochaetose in dorsal half *haruspex haruspex*
 - Head with posterior surface entirely or predominantly white or occasionally partially brown macrochaetose in dorsal half 21
- 21. Proctiger with vertical spines at base of posterior lateral arms long and strongly angulate posteriorly in apical third ...
 - *haruspex oncorhachis*
 - Proctiger with vertical spines at base of posterior lateral arms short and straight or occasionally slightly angulate posteriorly at tips 22
- 22. Abdominal transverse dark vittae on tergites 2-4 completely or partially interrupted dorsolaterally by longitudinal gray or white pruinose vittae
 - *haruspex martinorum*
 - Abdominal transverse dark vittae on tergites 2-4 usually not interrupted dorsolaterally *haruspex atrifasciata*
- 23(3). Posterior tarsal pulvilli small, less than half the length of the claws, may be barely visible at the base of the claws (fig. 10) 24
 - Posterior tarsal pulvilli medium to large, extending to or beyond middle of claws 26
- 24. Dististyles primarily or entirely brown or black pilose medially *sonorae*
 - Dististyles primarily or entirely white pilose medially 25
- 25. Abdominal tergites 2-5 without dorsolateral narrow longitudinal dark markings; locking fold with short erect pad of white pile (fig. 11); legs unicolorous testaceous *warneri*
 - Abdominal tergites 2-5 with dorsolateral dark longitudinal markings; locking fold with short erect pad of black pile; legs bicolored, femora partially or entirely dark *bilineata*
- 26(23). Posterior tarsal pulvilli narrow, about half as long as claws 27
 - Posterior tarsal pulvilli broad, about two-thirds as long as claws 28
- 27. Dististyles black and white pilose; femora and tibiae white pilose and macrochaetose; mesonotum white macrochaetose marginally *rubrifasciata*
 - Dististyles black pilose; posterior tibiae entirely or primarily black or brown macrochaetose; mesonotum entirely or primarily black macrochaetose marginally (in part) *mexicana*
- 28(26). Dististyles comate, with dense subapical brush of long hair, hairs longer and more closely spaced than those on the remainder of the dististyle 30
 - Dististyles not comate, without dense subapical brush of long hair, pilosity of uniform length throughout 29
- 29. Inner dististyle margins with narrow postmedian transverse incisions, inner margins of incisions narrowly separated; abdominal tergites 2-6 with the inner margin of the subquadrate dorsolateral longitudinal dark markings nearly straight medially, dorsal and ventral margins subparallel, markings usually broadly continuous between segments *infinita*
 - Inner dististyle margins with wide postmedian transverse incisions, inner margins of incisions widely separated; abdominal tergites 2-4 with the inner margin of the subquadrate dorsolateral longitudinal dark markings convex medially, dorsal and ventral margins not subparallel, markings narrowly constricted between segments. *melanura*
- 30(28). Abdominal tergites 5-7 with wide red subquadrate dorsolateral longitudinal markings; inner interbasal folds with anterior margin of emargination membranous, broadly expanded apically ...
 - *draperae*
 - Abdominal tergites 5-7 without red subquadrate dorsolateral longitudinal markings; inner interbasal folds with anterior margin of emargination not or narrowly membranous laterally, strongly clavate apically 31
- 31. Abdominal tergites 2-4 with middorsal dark linear maculations
 - (in part) *mexicana*
 - Abdominal tergites 2-4 without middorsal dark linear maculations 32
- 32. Dististyles with pile entirely or primarily black or brown; claspettes with ventral subapical lobes absent or medium in length and thin; apical half without short erect hairs *intonsa*
 - Dististyles with pile entirely or primarily white, golden, or light tan medially; claspettes with ventral subapical lobes long, apical half with short erect hairs *interrupta*

- 33(1). Claspettes strongly arcuate dorsoventrally from the base to the apex 34
- Claspettes not arcuate dorsoventrally, occasionally slightly arcuate laterally 46
34. Proctiger divided apically into long, lateral, hornlike projections on each side, extending outward at about a 90° angle from the longitudinal axis of the proctiger, sharply pointed at the apex . . . 35
- Proctiger without lateral hornlike apical projections (fig. 6) 37
35. Compound eyes separated from the lateral ocelli on the vertex by 1½ times the width of a lateral ocellus; proctiger with outer portion of lateral apical projections enclosed with flat sclerotized material extending from near outer tip diagonally across to the proctiger
- *hamata*
 - Compound eyes separated from the lateral ocelli on the vertex by less than the width of a lateral ocellus; outer portion of lateral apical projections not enclosed 36
36. Proctiger with lateral apical projections sharply angulate at inner base, extending laterally at almost right angles to proctiger; dististyles long white pilose; median projection of ninth abdominal sternite primarily white pilose
- *minckleyi*
 - Proctiger with lateral apical projections evenly rounded at inner base, shallowly bent outward at right angles to proctiger; dististyles black pilose; median projection of ninth abdominal sternite primarily black pilose *franckei*
- 37(34). Claspettes with dorsal inner margins without a membranous lining 38
- Claspettes with dorsal inner margins completely or partially membranous (fig. 12) 40
38. Proctiger broadly emarginate apically, inverted U-shaped, ventral projections of lateral extensions extending downward and shallowly bent anteriorly on each side of the aedeagus, terminal emargination broadly horizontal, not turned upward *bigelowi*
- Proctiger closed or shallowly divided apically, posterior portion turned sharply upward at narrow subapical constriction, without lateral extensions . . . 39
39. Abdominal tergites 5 and usually 6 and 7 with prominent dark dorsolateral maculations, segments 2-4 with large dorsolateral subtriangular black maculations separated or widely connected middorsally *femorialis*
- Abdominal tergites 5-7 without prominent dark dorsolateral maculations, segments 2-4 with dorsolateral dark markings not connected middorsally *rockefelleri*
- 40(37). Inner interbasal folds with a narrow deep elongate oblique emargination in subapical dorsal margin (fig. 13) 41
- Inner interbasal folds without emargination or with shallow or large deep transverse round emargination in subapical dorsal margin (fig. 14) 42
41. Dististyles with dorsal subapical margins shallowly emarginate (fig. 13); compound eyes separated from lateral ocelli on vertex by about the width of a lateral ocellus *lavignei*
- Dististyles with dorsal subapical margins convex (fig. 15); compound eyes separated from lateral ocelli on vertex by less than half the width of a lateral ocellus *mulegeae*
42. Inner interbasal folds with large deep transverse round emargination in median dorsal margin (fig. 14) 43
- Inner interbasal folds without large deep rounded emargination in median dorsal margin 44
43. Proctiger with apical upturned portion expanded laterally by membranous wide semitransparent extensions (fig. 4); dististyles and median posterior projection of ninth abdominal sternite brown or black pilose externally *augur*
- Proctiger with apical upturned portion narrow, not expanded or membranous laterally; dististyles and median posterior projection of ninth abdominal sternite long white pilose externally *fisheri*
- 44(42). Inner interbasal folds with ventral apex wide, obtusely rounded, prominently extending into the ventral opening between the dististyles; proctiger with rounded smooth vertical apex, not cleft medially or membranous and without vertical projections *chiltonae*
- Inner interbasal folds with ventral apex elongate, narrow, acutely pointed, not or barely extending into the ventral opening between the dististyles; proctiger shallowly divided and membranous dorsoapically, apex with sharp vertical lateral projections 45
45. Pronotum, mesonotum, and abdominal dorsum primarily tan pruinose; dor-

- solateral dark markings on abdominal tergites 2 and 3 not strongly oblique *linsleyi linsleyi*
- Pronotum, mesonotum, and abdominal dorsum primarily gray pruinose; dor-solateral dark markings on abdominal tergites 2 and 3 oblique, narrow basal end angled laterally . . . *linsleyi obliqua*
- 46(33). Abdominal tergite 4 without dark dorsal markings *powelli*
- Abdominal tergite 4 with dark dorsal markings 47
47. Hemitergites with posterior margin deeply emarginate; dististyles turned sharply inward subapically; hemitergite muscle attachment extending from base nearly to apical emargination *clavator*
- Hemitergites with posterior margin not deeply emarginate; dististyles almost straight or gradually curved inward in apical third; hemitergite muscle attachment not extending beyond the middle of the hemitergite 48
48. Proctiger with an apical pair of horizontal dorsoventrally flattened, sickle-shaped (falciform), sharp pointed blades protruding posteriorly from beneath dorsum of lateral shield and above aedeagus, blades narrowly separated basally, apices usually touching or overlapping 49
- Proctiger without sickle-shaped horizontal posterior blades 52
49. Abdominal tergites 3 and 4 with dark dorsal markings primarily or entirely black or brown pilose 50
- Abdominal tergites 3 and 4 with dark dorsal markings primarily or entirely white pilose 51
50. Abdominal tergites 2–4 with lateral margins white pilose; posterior head surface white macrochaetose dorsally *aldrichi*
- Abdominal tergites 2–4 with lateral margins black or brown pilose; posterior head surface black and white macrochaetose dorsally *arnaudi*
- 51(49). Abdominal dark markings on tergites 2 and 3 reaching apical margin medially; compound eyes usually separated from the lateral ocelli on the vertex by less than the width of a lateral ocellus *beameri*
- Abdominal dark markings on tergites 2 and 3 not reaching apical margin medially; compound eyes usually separated from the lateral ocelli on the vertex by the width or more than the width of a lateral ocellus *hispida*
- 52(48). Ninth abdominal sternite with median projection narrow elongate apically, extending posteriorly to or beyond posterior margin of outer interbasal folds which extend prominently into the ventral opening between the dististyles, densely black pilose laterally along midrib *alleni*
- Ninth abdominal sternite with median projection not narrow and not extending posteriorly to the apex of the interbasal folds, not densely pilose laterally along the midrib 53
53. Pteropleura bare anterior to metathoracic spiracles 54
- Pteropleura with sparse to dense long hair anterior to metathoracic spiracles 55
54. Compound eyes separated from lateral ocelli on the vertex by the width of a lateral ocellus; costal wing vein entirely or primarily black pilose; proctiger narrow dorsally, lateral margins expanded medially *painteri*
- Compound eyes separated from lateral ocelli on the vertex by less than half the width of a lateral ocellus; costal wing vein white pilose; proctiger broad dorsally, lateral margins parallel medially *caboae*
- 55(53). Abdominal sternites 2–4 pale brown or golden pilose *auripilosa*
- Abdominal sternites 2–4 white pilose 56
56. Inner interbasal folds without an emargination in the dorsal margin, margin sinuous, apex turned inward; abdominal tergites 5–7 primarily black or piceous, usually without pruinose but occasionally farinose *calida*
- Inner interbasal folds with dorsal margin deeply emarginate apically or subapically; abdominal tergite 5 white or gray pruinose 57
57. Median projection of ninth abdominal sternite wide and elongate, lateral membranous extensions parchment-like, not tumid, posterior margin angulate laterally, lateral margins usually subparallel medially, broadly overlapping dististyles laterally when closed, median posterior projection short and blunt 58
- Median projection of ninth abdominal sternite partially or entirely tumid or short, lateral membranous extensions

- with margins rounded or strongly divergent from base to subapical wide point, median posterior projection medium to long, usually acute 61
58. Proctiger with an elongate tubular collar separating the dorsal junction of the margins of the lateral shield from the apex of the proctiger 59
- Proctiger without a prominent collar, lateral shield margins forming a dorsal junction with the proctiger at or slightly anterior to the apex 60
59. Hemitergites primarily white pilose externally *caloris*
- Hemitergites primarily or entirely black or brown pilose externally . . . *pearcei*
- 60(58). Costal wing vein white pilose from the base to the apical one-quarter; compound eyes separated from the lateral ocelli on the vertex by more than the width of a lateral ocellus; terminalia gray pruinose (in part) *arena*
- Costal wing vein black pilose from the long white basal hairs to the apex; compound eyes separated from the lateral ocelli on the vertex by less than the width of a lateral ocellus; terminalia brown not pruinose *exta*
- 61(57). Hemitergites and dististyles gray pruinose throughout or in large part on exterior surface 65
- Hemitergites and dististyles without pruinosity or with just a trace of gray pruinosity on exterior surface 62
62. Costal wing vein primarily white pilose; compound eyes separated from the lateral ocelli on the vertex by the width or more than the width of a lateral ocellus (in part) *parkeri*
- Costal wing vein black pilose except for occasional white basal hairs; compound eyes separated from the lateral ocelli on the vertex by less than the width of a lateral ocellus 63
63. Posterior femora entirely or primarily white pilose externally; compound eyes separated from the lateral ocelli on the vertex by half or slightly more than half the width of a lateral ocellus *macswaini*
- Posterior femora entirely or primarily black or brown pilose externally; compound eyes separated from the lateral ocelli on the vertex by about half or less than half the width of a lateral ocellus 64
64. Posterior femora and tibiae, exclusive of the pruinosity, unicolorous piceous, reddish brown or black; proctiger robust, dorsal subapical collar short and broad; inner interbasal folds with dorsal margin deeply emarginate apically; size large *spectabilis*
- Posterior femora black, tibiae reddish brown, exclusive of the pruinosity; proctiger narrow, dorsal subapical collar medium in length and narrow; inner interbasal folds with dorsal margin moderately emarginate apically; size medium *voragocolis*
- 65(61). Compound eyes narrowly separated from the lateral ocelli on the vertex, almost touching 66
- Compound eyes separated from the lateral ocelli on the vertex by the width or more than the width of a lateral ocellus 67
66. Proctiger broad, dorsal margins subparallel medially; midposterior projection of the ninth abdominal sternite primarily or entirely white pilose; posterior tibiae primarily white pilose *canuta*
- Proctiger medium in width, dorsal margins shallowly angulate postmedially; midposterior projection of the ninth abdominal sternite black or black and white pilose; posterior tibiae primarily brown pilose *pruinosa*
- 67(65). Proctiger with an elongate dorsal collar between the lateral shield junction and the apex, lateral margins, anterior to the lateral shield, broadly angulate postmedially; abdominal dark dorsal markings on tergites 2-4 usually divided dorsolaterally by longitudinal gray vittae *davidsonorum*
- Proctiger without or with short dorsal collar; abdominal dark dorsal markings on tergites 3 and 4 not divided dorsolaterally 68
68. Posterior femora and tibiae brown pilose, entirely or primarily black macrochaetose 69
- Posterior femora white pilose and macrochaetose, posterior tibiae primarily or entirely white pilose and macrochaetose 70
69. Midposterior projection of ninth abdominal sternite with margins of lateral membranous extensions evenly rounded, widest medially . . (in part) *parkeri*
- Midposterior projection of ninth abdominal sternite with margins of lateral membranous extensions gradually divergent to subapical angles of posterior

- margin, widest postmedially, usually at subapical angle (in part) *arena*
- 70(68). Dististyles primarily or entirely brown or black pilose *ammophila hurdi*
 - Dististyles primarily or entirely white pilose 71
- 71. Abdominal tergite 2 with a middorsal diamond-shaped black maculation, not connected laterally to a smaller dorsolateral rounded dark spot; femora and tibiae unicolorous black or piceous *trimaculata*
 - Abdominal tergite 2 with a middorsal black maculation connected laterally with a dorsolateral dark spot; legs bicolorous, femora black or piceous, tibiae testaceous or light reddish brown *ammophila ammophila*

KEY TO *APIOCERA* FEMALES

1. Abdominal dorsolateral dark maculations on tergites 2 and 3 longitudinal, oblong, and usually narrow 2
 - Abdominal dorsolateral dark maculations on tergites 2 and usually 3 transverse or in variously shaped spots or absent 11
2. Mesopleura with disc of dorsocaudal angle pilose and usually macrochaetose 3
 - Mesopleura with disc of dorsocaudal angle bare or with few hairs along the ventral margin 4
3. Posterior femoral macrochaetae black *clavator*
 - Posterior femoral macrochaetae white *painteri hamata*
 - (in part) *rockefelleri*
 - (in part) *linsleyi linsleyi*
 - (in part) *linsleyi obliqua*
- 4(2). Costal wing vein entirely or primarily black pilose 5
 - Costal wing vein entirely or primarily white pilose or black and white pilose with outer row white and sparse, inner row black 6
5. Head with dorsal posterior surface and midpronotum with both black or brown and white macrochaetae *convergens*
 - Head with dorsal posterior surface and midpronotum white macrochaetose *beameri*
- 6(4). Posterior tarsi with long ventrolateral macrochaetae entirely or primarily black 7
 - Posterior tarsi with long ventrolateral

- macrochaetae entirely or primarily white 8
- 7. Posterior tibiae brown or black macrochaetose *mexicana*
 - Posterior tibiae white macrochaetose *draperae infinita melanura*
- 8(6). Abdominal tergites 2 and 3 with dorsolateral dark maculations narrow, dorsal and ventral margins parallel or subparallel medially 9
 - Abdominal tergites 2 and 3 with dorsolateral dark maculations moderately wide, dorsal and ventral margins shallowly convex medially, not subparallel *intonsa*
- 9. Mesonotal discal pile white *interrupta*
 - Mesonotal discal pile black or brown 10
- 10. Mesonotum, mesopleura, and abdominal terga on segments 1-4 primarily or entirely gray pruinose *rubrifasciata*
 - Mesonotum, mesopleura, and abdominal terga on segments 1-4 primarily or entirely tan pruinose . . (in part) *sonorae bilineata*
- 11(1). Tarsal pulvilli less than half as long as tarsal claws 12
 - Tarsal pulvilli half or more than half as long as tarsal claws 15
- 12. Posterior femora entirely or primarily white macrochaetose 13
 - Posterior femora entirely or primarily brown or black macrochaetose *fisheri*
- 13. Acanthoporphorites surrounding genital opening white; abdominal tergites 2-4 without dark dorsolateral markings *warneri*
 - Acanthoporphorites surrounding genital opening brown or black; abdominal tergites 2-4 usually with longitudinal oblong narrow dark markings 14
- 14. Posterior femora entirely or primarily white macrochaetose *chiltonae*
 - (in part) *sonorae*
 - Posterior femora entirely or primarily brown or black macrochaetose *fisheri*
- 15(11). Pteropleura with sparse to dense long hair anterior to metathoracic spiracles 16
 - Pteropleura usually bare or with a few scattered short hairs anterior to metathoracic spiracles 32
- 16. Costal wing vein entirely or predominantly white pilose 17
 - Costal wing vein entirely or predominantly black pilose 28
- 17. Abdominal tergite 1 entirely or primarily

- pale golden pilose, especially on lateral angles (in part) *auripilosa*
 (in part) *parkeri*
 (in part) *caloris*
- Abdominal tergite 1 entirely or primarily white pilose 18
18. Posterior tibiae primarily or entirely white macrochaetose 22
- Posterior tibiae primarily or entirely black or brown macrochaetose 19
19. Lateral pronotal angles (humeri) primarily black or brown macrochaetose . . . 20
- Lateral pronotal angles (humeri) primarily white macrochaetose 21
20. Dorsocaudal mesopleural angle bare (in part) *haruspex martinorum*
- Dorsocaudal mesopleural angle pilose and usually macrochaetose (in part) *pearcei*
 (in part) *parkeri*
 (in part) *caloris*
 (in part) *arena*
 (in part) *auripilosa*
- 21(19). Mesonotal lateral marginal macrochaetae primarily or entirely white (in part) *hispida*
- Mesonotal lateral marginal macrochaetae primarily or entirely black (in part) *parkeri*
- 22(18). Abdominal tergite 1 with lateral submarginal macrochaetae black 23
- Abdominal tergite 1 with lateral submarginal macrochaetae entirely or primarily white 24
23. Mesonotal marginal macrochaetae primarily or entirely white (in part) *hispida*
- Mesonotal marginal macrochaetae primarily or entirely black (in part) *parkeri*
- 24(22). Mesopleura with disc of dorsocaudal angle bare (in part) *haruspex martinorum*
- Mesopleura with disc of dorsocaudal angle pilose and usually macrochaetose 25
25. Mesonotal disc white pilose (in part) *hispida*
- Mesonotal disc brown or black pilose 26
26. Posterior tibiae with posterior surface brown and white pilose (in part) *auripilosa*
- Posterior tibiae with posterior surface white pilose 27
27. Posterior femora sparsely pruinose, ground color piceous or testaceous (in part) *arena trimaculata*
 (in part) *caloris*
- Posterior femora densely gray pruinose, obscuring testaceous ground color *ammophila hurdi*
ammophila ammophila
- 28(16). Mesopleura with disc of dorsocaudal angle bare, without pile or macrochaetae (in part) *haruspex atrifasciata*
- Mesopleura with disc of dorsocaudal angle moderately to densely pilose, sparsely macrochaetose 29
29. Mesonotum with lateral marginal macrochaetae primarily white 30
- Mesonotum with lateral marginal macrochaetae primarily black 31
30. Legs with femora usually piceous, tibiae reddish brown; costal wing vein usually primarily black pilose (in part) *hispida*
 (in part) *exta*
- Legs usually unicolorous testaceous, femora occasionally slightly darker than tibiae; costal wing vein usually primarily white pilose (in part) *caloris*
- 31(29). Pteropleura densely long white pilose; size usually large and robust *aldrichi*
alleni
spectabilis
- Pteropleura sparsely to moderately white pilose; size usually small to medium, narrow (in part) *exta*
 (in part) *pearcei*
 (in part) *macswaini*
 (in part) *voragocolis varia?*
- 32(15). Posterior tibiae with posterior surface, between rows of macrochaetae, entirely or primarily white pilose 33
- Posterior tibiae with posterior surface, between rows of macrochaetae, entirely or primarily brown or black pilose . . . 41
33. Abdominal tergites 2 and 3 with discal pile entirely or partially white 34
- Abdominal tergites 2 and 3 with discal pile entirely brown or black 37
34. Costal wing vein with white pile usually extending from the base to near the apex 35
- Costal wing vein white pilose basally, black and white pilose medially, black pilose in apical third 38
35. Abdominal tergite 1 with golden lateral pile, submarginal macrochaetae primarily or entirely white (in part) *auripilosa*

- Abdominal tergite 1 with white lateral pile, submarginal macrochaetae primarily or entirely black 36
- 36. Abdominal tergite 4 with dorsolateral longitudinal, oblong, narrow dark markings *augur*
- Abdominal tergite 4 with dorsolateral dark markings or with a subtriangular or rounded dorsolateral spot
 (in part) *rockefelleri*
 (in part) *minckleyi*
 *parahydra*
 (in part) *haruspex martinorum*
- 37(33). Posterior tarsi with outer surface of segment 1 primarily white pilose
 (in part) *haruspex martinorum*
- Posterior tarsi with outer surface of segment 1 brown or black pilose
 *ogradyi*
- 38(34). Scutellar disc primarily brown pilose ..
 39
- Scutellar disc primarily white pilose ...
 (in part) *rockefelleri*
 (in part) *franckei*
 (in part) *minckleyi*
 (in part) *horticolis*
 *exta*
- 39. Costal wing vein black pilose or mixed black and white pilose basally
 (in part) *macswaini*
- Costal wing vein white pilose basally ..
 40
- 40. Costal wing vein white pilose from base to near apex .. (in part) *linsleyi linsleyi*
 (in part) *linsleyi obliqua*
- Costal wing vein black and white pilose from basal long white hairs to apical third of wing, black pilose in apical third (in part) *wilcoxi*
- 41(32). Posterior femora with outer surface entirely or primarily white pilose medially 46
- Posterior femora with outer surface entirely or primarily brown or black pilose medially 42
- 42. Abdominal tergite 4 with discal pile primarily white (in part) *notata*
- Abdominal tergite 4 with discal pile brown or black 43
- 43. Anterior femora with inner concave surface entirely or primarily white pilose 45
- Anterior femora with inner concave surface primarily brown or black pilose ..
 44
- 44. Posterior femora with outer surface black and white pilose .. (in part) *acuticauda*
- Posterior femora with outer surface black pilose (in part) *fallax*
 (in part) *haruspex atrifasciata*
 *haruspex haruspex*
 *haruspex oncorhachis*
- 45(43). Abdominal tergite two with dorsolateral dark markings transverse, elliptical ..
 (in part) *acuticauda*
- Abdominal tergite two with dorsolateral dark markings subtriangular
 *chrysolasia*
 (in part) *notata*
 (in part) *barri*
- 46(41). Costal wing vein with white pile extending from base to or beyond the middle of the wing 47
- Costal wing vein black pilose or without white pile extending beyond the middle of the wing 50
- 47. Mesopleura with disc of dorsocaudal angle bare or sparsely hairy along ventral edge (in part) *wilcoxi*
 (in part) *franckei*
 (in part) *rockefelleri*
- Mesopleura with disc of dorsocaudal angle sparsely to moderately densely pilose, usually macrochaetose 48
- 48. Head with vertex between the lateral ocelli primarily white pilose
 (in part) *minckleyi*
 (in part) *bigelowi*
 (in part) *franckei*
 (in part) *auripilosa*
- Head with vertex between the lateral ocelli black pilose 49
- 49. Abdominal dorsolateral dark markings on tergites 2 and 3 bare and shiny; outer femoral surface with faint or evident median longitudinal dark stripe
 (in part) *rockefelleri*
 (in part) *femoralis*
- Abdominal dorsolateral dark markings on tergites 2 and 3 absent or pruinose and dull; outer femoral surface without median longitudinal dark stripe
 (in part) *bigelowi*
 (in part) *franckei*
 (in part) *minckleyi*
 (in part) *linsleyi obliqua*
- 50(46). Head with dorsal posterior surface and/or midpronotum with both black and white macrochaetae ... (in part) *barri*
 (in part) *fallax*
 (in part) *volucra*
 (in part) *horticolis*
 (in part) *mortensoni*
 (in part) *bibula*

- (in part) *acuticauda*
 (in part) *haruspex atrifasciata*
- Head with dorsal posterior surface and/or midpronotum white macrochaetose 51
 - 51. Legs unicolorous testaceous or reddish, femora pruinose (in part) *mortensoni* (in part) *bibula* (in part) *sylvestris* (in part) *femoralis*
 - Legs bicolorous, femora piceous or reddish brown, densely pruinose, tibiae testaceous or reddish brown 52
 - 52. Abdominal tergites 2 and 3 with dorso-lateral dark maculations with posterior margin nearly straight, parallel with apical margin of tergites (in part) *volucra*
 - Abdominal tergites 2 and 3 with dorso-lateral dark maculations with posterior margin rounded, not parallel with apical margin of tergites (in part) *sylvestris* (in part) *macswaini*

No females are known for the following: *A. arnaudi*, *powelli*, *caboae*, *calida*, *canuta*, *pruinosa*, *davidsonorum*, *constricta*, *lavignei*, and *mulegeae*.

Apiocera mulegeae, new species

Figure 15

DIAGNOSIS: Medium-size, narrow; pteropleura bare, white pruinose anterior to metathoracic spiracles; dististyles open ventrally in apical half, inner margins without postmedian transverse incision; posterior margin of ninth abdominal sternite without brush of long recumbent pile, surface shallowly convex, median posterior projection with lateral extensions leathery in appearance, overlapping dististyles laterally for almost its entire length; claspettes arcuate dorsoventrally from base to apex, dorsal inner margins completely membranous; proctiger without lateral horn-like apical projections; inner interbasal folds deeply obliquely emarginate in subapical dorsal margin; dististyles with dorsal subapical margins convex (fig. 15); compound eyes separated from the lateral ocelli on vertex by less than half the width of a lateral ocellus.

DESCRIPTION

MALE: Head with front white pruinose and pilose, vertex with few brown hairs anterior

to lateral ocelli; antennal segments 1 and 2 white pruinose, pilose, and macrochaetose; third segment dark, robust, widest medially, ending apically in short acute tooth; palpi short, terminal segment wide, white pruinose, and pilose; posterior head surface white pruinose, pilose, and macrochaetose; compound eyes separated from lateral ocelli on vertex by less than half the width of a lateral ocellus. **Thorax** with pronotal angles gray pruinose, black pilose, and macrochaetose; mesonotal markings brown pruinose; surface other than brown markings sparsely gray pruinose, brown pilose; two median discal dark longitudinal lines narrowly separated, lateral thicker dark vittae, one on each side, interrupted postmedially by diagonal, shallow gray depression, marginal macrochaetae black, pile black and white mixed; mesopleura gray pruinose, sparsely irregularly white pilose, dorsocaudal angle gray pruinose, sparsely white pilose, few black macrochaetae, pteropleura anterior to metathoracic spiracles bare, gray pruinose; wings with costal margin white pilose basally, primarily black pilose with few scattered white hairs from basal white pile to apex; scutellum pale brown pruinose in median base, remainder gray pruinose, surface sparsely brown pilose, posterior margin with submarginal black macrochaetae. **Legs** with coxae gray pruinose, white pilose, and macrochaetose; femora piceous, anterior and middle pairs gray pruinose, white pilose, black macrochaetose; posterior pair gray pruinose, black pilose, and macrochaetose; tibiae reddish brown, anterior and middle pair sparsely gray pruinose, white pilose, black macrochaetose; posterior pair sparsely gray pruinose, brown pilose, black macrochaetose; tarsi reddish brown, anterior and middle pairs white pilose, black macrochaetose, posterior pair brown pilose, black macrochaetose; tarsal pulvilli large, extending two-thirds the length of the tarsal claws. **Abdomen** maculated; tergite 1 narrowly tan pruinose basally, median brown pruinose spot not reaching apical margin, apical margin and lateral discal areas gray pruinose, surface with discal pile brownish, lateral long pile white and brown mixed, submarginal macrochaetae black; tergite 2 brown pruinose basally, median brown pruinose area extending from base to apical third, plural margin

with elongate, narrow, pale brown longitudinal stripe, dorsolateral median dark irregular spot black, remainder of surface gray pruinose, discal pile brown and sparse, lateral pile white, longer, denser; tergites 3 and 4 with median longitudinal discal vitta extending posteriorly from base to apical margin on tergite 4, not reaching margin on tergite 3, dorsolateral black markings elongate widest near posterior end, not extending from margin to margin, ventral margin straight, dorsal margin convex, pleural brown longitudinal narrow vittae extending from basal margin to near apical margin, discal surface between maculations gray pruinose, discal pile brown, pleural pile white; tergites 5–7 gray pruinose, short white pilose, tergite 5 with small dark dorsolateral spot; sternites 1–7 immaculate, gray pruinose, white pilose. **Terminalia: Exterior.** Dark brown with basal piceous areas, brown pilose throughout, open ventrally; hemitergites short, dorsal margin shallowly rounded to apical third, sharply angled downward to acute tip, apex without fingerlike projection or invagination, posterior margin lacking, ventral margin strongly emarginate behind apex, extending anteriorly to about middle of ventral margin, evenly rounded to base, surface faintly gray pruinose in small spots, sparsely brown pilose; dististyles brown apically, piceous basally, dorsal margin gradually tapered posteriorly to blunt apex, not emarginate (fig. 15), apical third with glabrous membranous area where locking fold engages margin, ventral margin obtusely dentate postmedially, membranous area extending from posterior base of dent straight inward almost to median posterior projection of ninth sternite, extending diagonally downward and outward disappearing behind the lateral leathery projections of the median posterior projection of the ninth sternite; median posterior projection of ninth sternite convex, lateral extensions leathery in appearance, overlapping dististyles laterally for almost its entire length, apex blunt, bent sharply inward toward aedeagus, surface sparsely irregularly black pilose. **Terminalia: Interior.** Hemitergite surface shiny, mostly glabrous, without tuft of pile on or at base of locking fold, tuberculate area L-shaped, upper arm starting at angle in dorsal margin, lower arm ending on upper margin behind

apex and at posterior edge of submarginal hairy area, locking fold semitransparent, attached to hemitergite surface subparallel to ventral margin above emargination in ventral margin, strongly projecting below the margin of the emargination, extending from behind apex straight to about apical third of hemitergite, not strongly angled from surface, muscle attachment of hemitergite in basal third only; proctiger with horizontal portion short, broadly expanded toward base, narrowly constricted at junction with upturned apical portion, apical half turned upward at about a 45° angle, oblong rectangular, sides parallel, posterior outer angles with sharp dorsal spines, median elongate membranous area widening from base to apex, downward extension enclosing aedeagus; claspettes arcuate dorsoventrally from base to apex, inner margins dorsally with membranous lining, surface glabrous, ventral subapical lobes prominent, extending downward, enlarged apically, sparsely short pilose; interbasal folds with deep diagonal emargination subapically in dorsal margin, apex sharply pointed, projecting into ventral space between dististyles (when closed). Length 19.0 mm; mesonotal width 4.0 mm.

FEMALE: Unknown.

TYPE MATERIAL

HOLOTYPE: Male, Mexico, Baja California Sur, 10 km southwest Mulege, August 24–25, 1977, Fisher and Westcott, deposited in the American Museum of Natural History, New York.

PARATOPOTYPES: Same data as holotype (1 male MAC). Same data as holotype, R. R. Snelling (1 male LACM).

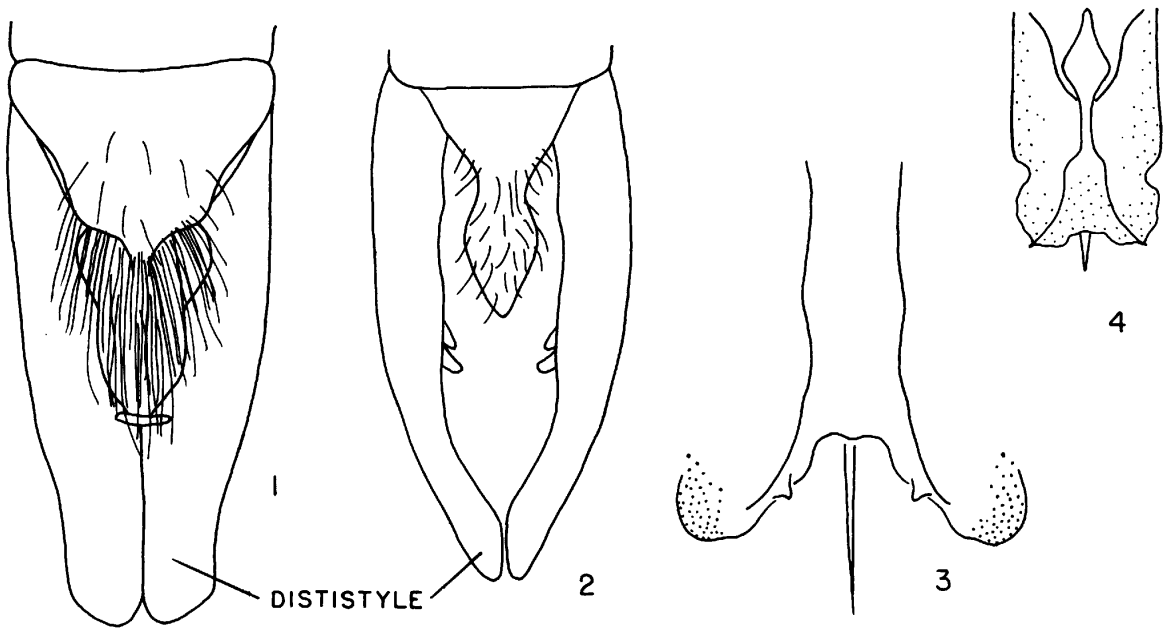
The holotype and one paratopotype were given to me by Eric M. Fisher.

DISCUSSION

ETYMOLOGY: The species is named after the city of Mulege near the collecting site on the east coast of Baja California Sur, Mexico.

ECOLOGY: The only information available is that all three specimens were collected on sand dunes.

VARIABILITY: In one paratopotype the tibiae are unicolorous piceous with the femora. In others the apices of the dististyles are white pilose or extensively white pilose along the



FIGS. 1-4. Male terminalia. 1-2. Ventral views. 1. *Apiocera haruspex haruspex*. 2. *A. aldrichi*. 3-4. Proctigers. 3. *A. foleyi*. 4. Upturned portion of proctiger, *A. augur*.

ventral margin; the median posterior projection of the ninth abdominal sternite may have both black and white pile; there may be white macrochaetae mixed in with the black on the legs and margins of the mesonotum. The membranous lining on the inner claspette margins may be wide or narrow but it is always complete and the dark markings on the abdominal tergites vary in extent to a minor degree.

RELATIONSHIPS: *Apiocera mulegeae* appears to be most closely related to *lavignei* even though the latter species is known only from Colima in mainland Mexico. Both species key out in dichotomy 41, separated by *lavignei* having a subapical shallow emargination in the dorsal dististyle margin (fig. 13) and the compound eyes are separated from the lateral ocelli by more than half the width of a lateral ocellus. In *mulegeae* the subapical dorsal dististyle margin is convex (fig. 15) and the compound eyes are separated from the lateral ocelli by less than half the width of a lateral ocellus. In addition to these differences, in *lavignei* the dististyles are longer and more acutely pointed, the upturned portion of the proctiger lacks the lateral apical spines of *mulegeae*, and the abdominal black

maculation pattern is not broken into dorsolateral spots as it is in *mulegeae*. However, in *lavignei* the attachment of the locking fold to the lower hemitergite surface, the rectangular upturned proctiger, the oblique emarginations in the interbasal folds (fig. 13), the inner premedian projections on the inner dististyle margins, the glabrous or near-glabrous claspette surfaces, and the L-shaped tuberculate area on the inner hemitergite surface are similar to those in *mulegeae*.

Two other species, *augur* and *fisheri*, appear to be related but both can be separated from *mulegeae* and *lavignei* by their large deep transverse round emargination in the middorsal upper margin of the interbasal folds (fig. 14). In *mulegeae* and *lavignei* this emargination is subapical and is narrow, deep, elongate, and oblique (fig. 13). In *augur* the upturned portion of the proctiger is widely semitransparent membranous marginally, a feature not shared with *fisheri* (fig. 4), *mulegeae*, or *lavignei*; *augur* is known only from the states of Sonora and Sinaloa on mainland Mexico. *Apiocera fisheri* also differs from both *lavignei* and *mulegeae* by being larger and brownish in color; its costal wing margins and its terminalia are white pilose. Geo-

graphically *fisheri* is more proximate to *mulegeae* than any of the others, occurring at Baja Santa Maria, 24 miles south of San Felipe, Baja California Norte, Mexico. Other Baja California species of *Apiocera* are only distantly related.

Apiocera varia, new species

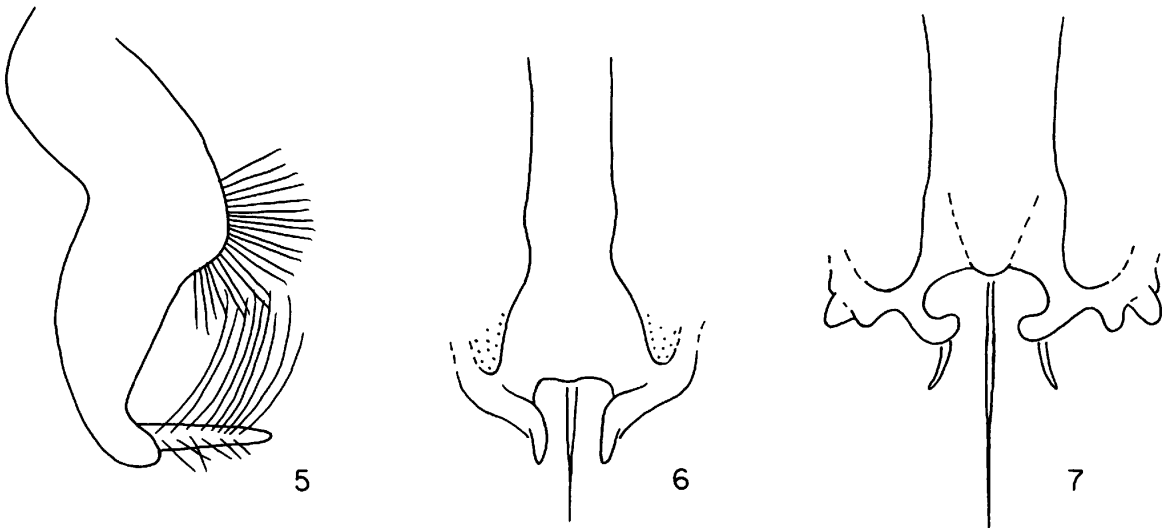
Figure 8

DIAGNOSIS: Medium-size, narrow, dark in color, abdominal maculations variable; terminalia closed ventrally, each dististyle with single transverse incision in postmedian inner margin, inner margins apposed from incision to apex; posterior margin of ninth abdominal sternite with dense, long, recumbent black pile extending from basal and lateral margins posteriorly beyond incision in dististyle margin; locking folds on inner hemitergite surface with sparse, erect black hairs along junction between the surface and the fold, surface convoluted, bare, not reaching posterior or ventral hemitergite margins; proctiger broad, margins only slightly convex medially, narrowly, deeply incised anterior to middorsal opening (fig. 8), apex not divided into inverted Y-shaped projections, lateral apical extensions broad, evenly rounded outward, downward, and anteriorly, margin and surface smooth (fig. 8), posterior projections beyond middorsal opening prominent, bent sharply downward; ventral claspette margin with all median golden hairs short, arranged fanlike, ventral subapical lobes absent, represented by long, curved, golden hairs in narrow compact cluster, curving inward; compound eyes separated from lateral ocelli on vertex by slightly more than half the width of a lateral ocellus.

DESCRIPTION

MALE: Head with front white pruinose and pilose, vertex between ocelli sparsely brown pilose; antennal segments 1 and 2 white pruinose and macrochaetose, segment 3 dark pruinose, bare, ending in short acute tooth; palpi short, white pruinose and pilose; posterior head surface white pruinose, primarily white macrochaetose; compound eyes separated from lateral ocelli on vertex by slightly more than half the width of a lateral ocellus. **Thorax** with pronotal angles (humeri) gray

pruinose, black pilose, and macrochaetose; mesonotum brown pilose, maculations brown pruinose interrupted by gray pruinose areas, lateral margins brown and white pilose, black macrochaetose; mesopleura gray pruinose, sparsely white pilose, dorsocaudal angle bare, gray pruinose; pteropleura bare anterior to metathoracic spiracle; wings with costal margin black pilose throughout; scutellum gray pruinose, brown pilose, submarginal macrochaetae black. **Legs** bicolored, coxae densely gray pruinose, sparsely white pilose, and macrochaetose; femora densely gray pruinose, ground color dark, anterior pair brown pilose internally, white pilose externally, macrochaetae primarily white, middle pair brown pilose externally, white pilose internally, macrochaetae primarily black, posterior pair nonpilose internally, brown pilose externally, macrochaetae black; tibiae reddish brown, sparsely gray pruinose, anterior pair golden pilose internally, white pilose externally, black macrochaetose, middle and posterior pairs brown pilose, black macrochaetose, tarsi reddish brown, black pilose and macrochaetose, tarsal pulvilli large, strongly expanded toward apex, about three-quarters the length of the tarsal claws. **Abdomen** dark in color, tergites heavily maculated, tergite 1 gray pruinose laterally, brown pruinose medially from basal to apical borders, densely brown and white pilose laterally, sparsely brown and white pilose medially, subapical marginal macrochaetae black; tergite 2 pale brownish pruinose in basal third, longitudinal black discal maculations beginning at posterior margin of brown pruinose transverse basal vitta, dorsolateral black longitudinal vittae straight basally, rounded apically, not reaching apical border of tergite, discal black V-shaped maculation with narrow tip reaching posterior tergite margin, markings separated by white pruinose areas, disc sparsely brown and black pilose; tergite 3 with white pruinose dorsolateral areas a continuation of those on tergite 2, interrupted medially at basal margin, extending and narrowing posteriorly to middle of tergite, apical half of tergite black, disc brown and black pilose; tergite 4 with narrow white pruinose basal border narrowly interrupted medially, narrow white apical pruinose border not interrupted, disc with two irregular small white



FIGS. 5-7. Male terminalia, claspette, proctigers. 5. Claspette. *Apiocera haruspex haruspex*. 6-7. Proctigers. 6. *A. horticolis*. 7. *A. chrysolasia*.

pruinose dorsolateral spots, remainder of tergite black, brown pilose; tergites 5-7 primarily white pruinose, brown and white pilose, each tergite with irregular dorsolateral small brown spot, tergites 6 and 7 with median discal dark longitudinal line; pleural areas of tergites 2-7 with narrow longitudinal dark vittae along suture; sternites white pilose and pruinose. **Terminalia: Exterior.** Dark brown, black pilose throughout, closed ventrally; hemitergites with dorsal margin straight to slightly beyond middle, shallowly angled downward to fingerlike apical projection; posterior margin deeply incised below apex, gradually descending and rounded to ventral margin and to base; dististyles with margins subparallel, dorsal margin widely glabrous apically, apex bluntly rounded, ventral margins slightly rounded, apposed in apical third, postmedian incisions narrow transverse shallow, extending inward about one-third the dististyle diameter, shallowly arcuate; median projection of ninth abdominal sternite densely long black pilose basally and laterally, pile extending posteriorly beyond transverse incisions in inner dististyle margins. **Terminalia: Interior.** Hemitergites with surface bare, shiny; tuberculate area slightly postmedian in upper half of surface, wide and oblique; locking fold with surface bare, convoluted, junction with surface sparsely short

erect black pilose, ventral margin not reaching ventral or posterior hemitergite margins, ending posteriorly at lower margin of subapical incision forming fingerlike apical extension; proctiger with lateral margins subparallel, slightly expanded medially, narrowly constricted anterior to middorsal opening, middorsal opening rounded, lateral extensions smooth, angled downward and anteriorly, posterior angles with dorsal short blunt straight vertical spines, posterior extensions arising beneath dorsal spines, S-shaped extending downward (fig. 8); claspettes straight, inner margin moderately densely golden pilose, apex slightly enlarged, median ventral margin with short golden hairs arranged fanlike, subapical ventral lobes absent, represented by several long golden curved compacted hairs arising from area usually occupied by lobes; interbasal folds biemarginate dorsoapically. Length 18.5 mm; mesonotal width 4.0 mm.

FEMALE: Unknown.

TYPE MATERIAL

HOLOTYPE: Male, California, Kernville, Kern County, July 24, 1940, L. J. Lipovsky, deposited in the Snow Entomological Museum, University of Kansas, Lawrence.

PARATOPOTYPES: Same data as holotype but

R. H. Beamer, D. E. Hardy, L. J. Lipovsky, E. E. Kenaga (5 paratopotypes UK, 4 MAC Tempe, 1 AMNH).

DISCUSSION

ETYMOLOGY: From the Latin *vario* meaning to diversify, vary, or differ; in reference to the variability exhibited in the abdominal maculations.

ECOLOGY: No information available.

VARIABILITY: In basic characteristics there is little variability in the series of 11 male specimens. However, in abdominal tergite maculation they vary in the extent of both the black areas and the white pruinose areas. Only one other male is very similar to the holotype in abdominal pattern. The basic pattern of the discal and dorsolateral areas is evident in all specimens but its extent varies. The pleural dark markings may be completely lacking or only partially represented.

RELATIONSHIPS: *Apiocera varia* appears to be related to *chrysolasia*. These two species are evidently the only ones in the genus that completely lack the ventral subapical lobes on the claspettes. In both species a compacted group of a few long curved golden hairs arises from the area from which the lobes usually originate. They also resemble one another in other characteristics including the abdominal tergite maculation. However, in *chrysolasia* the proctiger is explanate instead of sharply constricted anterior to the dorsal apical opening and the lateral projections are rough and irregular instead of being smooth and regular as in *varia* (fig. 8). The only other species that have the ventral subapical claspette lobes reduced are *ogradyi* and *horticolis*. Both of these have short ventral subapical claspette lobes and the proctiger is explanate anterior to the dorsal apical opening. In *varia* the lobes are absent and the lateral proctiger margins are deeply constricted anterior to the middorsal opening.

Apiocera warneri, new species

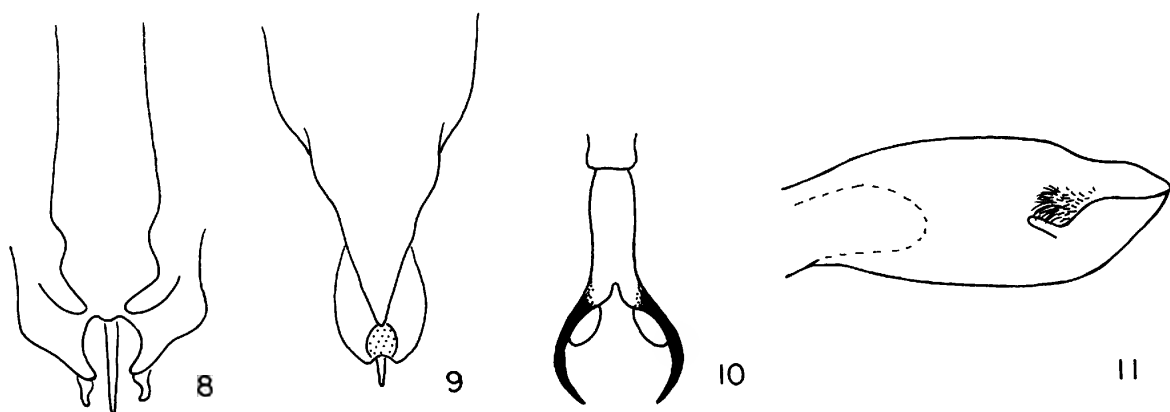
Figure 11

DIAGNOSIS: Medium-size, narrow, pale in color; pteropleura bare, white pruinose anterior to the metathoracic spiracles; dististyles white pilose, closed ventrally in apical half, inner margins with a single deep wide

transverse postmedian incision; locking folds on inner hemitergite surface densely clothed with short erect white pile in basal half of surface; legs unicolorous testaceous, posterior tarsal pulvilli less than half the length of the claws (see fig. 10); abdominal tergites 2–5 without dorsolateral dark markings.

DESCRIPTION

MALE: Head with front and vertex white pruinose and pilose; antennal segments 1 and 2 white pruinose, pilose, and macrochaetose; third segment light brown in apical two-thirds, white pruinose basally, bare, terminating in short acute tooth; palpi short, white pruinose, densely white pilose; posterior head surface white pruinose, pilose, and macrochaetose; compound eyes separated from lateral ocelli on vertex by slightly more than the width of a lateral ocellus. **Thorax** with pronotal angles light tan pruinose, white pilose, and macrochaetose; mesonotum piceous, light tan pruinose (rubbed), short sparse white pilose, without evident discal markings, lateral margins white pilose and macrochaetose; mesopleura off-white pruinose (partially rubbed), dorsocaudal angles white pruinose without pile or macrochaetae, pteropleura white pruinose without pile anterior to metathoracic spiracles. **Legs** uniformly testaceous, sparsely irregularly white pruinose, pile and macrochaetae white; tarsal pulvilli small, less than half the length of the claws (see fig. 10). **Abdomen** with tergites uniformly testaceous except for discal indistinct dark areas on tergites 1–3, white pruinose and pilose, sternites white pruinose and pilose, immaculate. **Terminalia: Exterior.** Uniformly testaceous, non-pruinose, white pilose; hemitergites with dorsal margin almost straight in basal two-thirds, shallowly emarginate in apical one-third, ending in blunt rounded infold continuous with locking fold on inner surface, posterior margin straight, diagonally sloping anteriorly in descending portion, evenly rounded into ventral margin, ventral margin straight to near base; dististyles closed beneath in apical half, bluntly pointed apically, dorsal margins gradually converging in apical half to apex, inner margins with deep transverse wide postmedian incisions; posterior margin of ninth abdominal sternite with long white recumbent



FIGS. 8–11. Male terminalia structures, proctigers, hemitergite, posterior tarsal pulvilli. 8–9. Proctigers. 8. *Apiocera varia*. 9. *A. constricta*. 10. Posterior tarsal pulvilli. *A. sonoreae*. 11. Locking fold on inner hemitergite surface. *A. warneri*.

sparse pile not reaching posteriorly to post-median dististyle incisions. **Terminalia: Interior.** Hemitergites with surface shiny, tuberculate area irregular in shape, in upper median portion of surface; locking fold with lower margin a continuation of the upper hemitergite margin, basal attachment near dorsal margin, sloping gradually anteriorly and downward, lower margin gradually convoluted, not reaching posterior or ventral hemitergite margins, surface with dense pad of short erect white bristlelike pile covering basal half (fig. 11); proctiger with lateral margins divergent basally, gradually converging apically to constriction anterior to narrow middorsal subapical opening, posterior apical projections narrow, projecting strongly downward around aedeagus, without dorsal spines or projections; claspettes straight, inner margins sparsely golden pilose, median ventral pile short golden arranged fanlike, margins expanded distally, ventral subapical lobes long slightly curved downward, sparsely short white pilose, outer margin without long pile. Interbasal folds with dorsal subapical margin of inner fold deeply widely emarginate, outer fold with apical projection visible around apex of inner fold. Length 20 mm; mesonotal width 4 mm.

FEMALE: Similar to the male except in the usual secondary sexual characteristics. The abdomen is immaculate, all pile, pruinosity, and macrochaetosity is white except for some of the retrose pile on segments 5–7, which is brown. The acanthophorites surrounding the

genital opening are white and the tarsal pulvilli are only about half the length of those in the male. Length 20 mm; mesonotal width 6 mm.

TYPE MATERIAL

HOLOTYPE: Male, California, 1.5 miles west Glamis, Imperial County, September 15, 1982, W. B. Warner, deposited in the American Museum of Natural History, New York.

ALLOTYPE: Female, same data as holotype except 4 miles north Glamis, deposited in the American Museum of Natural History.

PARATOPOTYPES: Same data as holotype (3 females MAC, Tempe).

DISCUSSION

ETYMOLOGY: The species is named in honor of W. (Bill) B. Warner who presented the specimens to the author and in recognition of his superior collecting and observational abilities in most groups of insects. His cooperation over many years is greatly appreciated.

ECOLOGY: The following habitat and behavioral information was communicated to me by Bill Warner: The allotype female from 4 miles north of Glamis was collected in a 10-m wide sandy wash within about 50 ft of a railroad culvert which was about 2 miles east of the edge of the Algodones dunes. The collection was made at midday. The holotype and one female paratopotype were found in late afternoon, about 5:00 P.M., 1.5 miles west

of Glamis on the north side of the Glamis to Brawley highway where it cuts through the Algodones dune field. They were found within 100 m of the road sitting on the open sand. They were very wary, usually flying when the collector was within about 10 ft and the escape flights were short, 5–20 ft, and low over the sand. Each specimen had to be very slowly stalked until within net's reach and then rapidly scooped up, invariably along with some sand. The other two female paratopotypes were taken at an ultraviolet light. The type locality was on the open, unconsolidated dunes, whereas specimens collected 4 miles north of Glamis were off the main dune field in a sandy area with scattered, large Blue Palo Verde trees, *Cercidium floridum* Benth.

VARIABILITY: There is little variability exhibited in the short series available. The ground color of the mesonotum in the male holotype is piceous whereas, in the allotype female, it appears to be brown beneath a thick pruinose covering. No regular markings are evident. However, in the female paratopotypes the pruinosity has been largely rubbed off the mesonotum revealing the usual pattern in darker brown color. The narrowly separated, double discal, longitudinal vittae are evident as are the irregularly shaped, wider, lateral vittae. In all four females the acanthophorites are white, a feature evidently unique in this species.

RELATIONSHIPS: This pale, practically immaculate species appears to be most closely related to *sonorae* and *bilineata* but can be readily separated from both by its lack of dorsolateral longitudinal dark markings on abdominal tergites 2–4. In general appearance it more closely resembles *sonorae* but differs by having the pile on the terminalia white instead of brown and its compound eyes separated from the lateral ocelli on the vertex by slightly more than the width of a lateral ocellus. In *sonorae* they are separated by almost twice the diameter of a lateral ocellus. The patch of short erect pile on the locking folds of the hemitergites is white in *warneri* and black in *sonorae*. Both *sonorae* and *warneri* have been collected near Glamis on the Algodones dunes but the collecting records indicate a difference in seasonality, *sonorae* being active in June, *warneri* in September.

In *bilineata* the locking fold pad is again black instead of white pilose as in *warneri*, its legs are bicolorous rather than unicolorous, its size is smaller, its color darker, and its compound eyes are more widely separated from the lateral ocelli than in *warneri*.

Apiocera constricta, new species

Figure 9

DIAGNOSIS: Medium-size, narrow; pteropleura bare, white pruinose anterior to metathoracic spiracles; dististyles closed ventrally in apical third, inner margins with postmedian narrow transverse incision; posterior margin of ninth abdominal sternite densely clothed with long black recumbent pile, extending posteriorly beyond the postmedian marginal incisions on the dististyles; locking folds on inner hemitergite surface with small tuft of short black hairs at midbase on junction with hemitergite surface, fold not reaching hemitergite margin, surface without prominent scattered hairs; proctiger with apex narrowly open, not divided or Y-shaped, not extending dorsally and posteriorly beyond middorsal apical opening, apices without dorsal acute projections, dorsolateral margins gradually diverging anteriorly, not subparallel, strongly constricted subapically before middorsal apical opening (fig. 9); claspettes with ventral subapical lobes medium in length, conspicuous, outer margin densely clothed with long curved golden pile; ventral claspette margin with median golden hairs short, arranged fanlike; costal wing vein white pilose in basal third; transverse dark vittae on abdominal tergites 3 and 4 not interrupted dorsolaterally.

DESCRIPTION

MALE: **Head** with front white pilose and pruinose, vertex between lateral ocelli dark, sparsely brown pilose; antennae three-segmented, segments 1 and 2 white pruinose, pilose, and macrochaetose, segment 3 bare, sparsely white pruinose, ending apically in a short acute tooth; palpi white pruinose and pilose; posterior head surface white pruinose, pilose, and macrochaetose; compound eyes separated from the lateral ocelli on the vertex by less than half the width of a lateral ocellus, almost touching. **Thorax** (badly rubbed) with

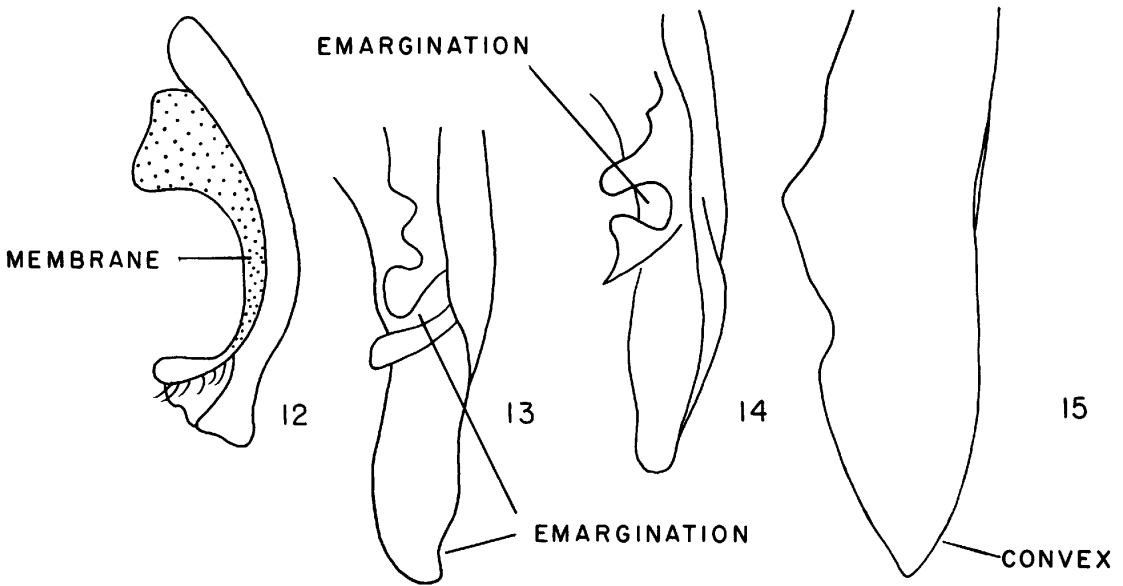
pronotal angles white pruinose and pilose, black and white macrochaetose; mesonotum rubbed, markings and pilosity obscured, lateral margins white pilose and macrochaetose; mesopleura light gray pruinose, sparsely pilose, dorsocaudal angle bare, gray pruinose, pteropleura anterior to metathoracic spiracle bare, light gray pruinose; wings with costal margin white pilose in basal half, black pilose in apical half; scutellum badly rubbed, sparsely black pilose, posterior marginal macrochaetae black. **Legs** with coxae gray pruinose, white pilose and macrochaetose; anterior and middle femora piceous, white pilose, and macrochaetose, posterior femora piceous, black and white pilose, black macrochaetose; tibiae reddish brown, anterior and middle pairs white pilose, black macrochaetose, posterior pair brown pilose, black macrochaetose; tarsi reddish brown, brown pilose, and macrochaetose, pulvilli large, broadly expanded apically, about two-thirds as long as tarsal claws. **Abdomen** with tergite 1 brownish pruinose in basal third with median posterior projection reaching posterior margin, apical two-thirds on each side of interruption gray pruinose, surface white pilose dorsally, black and white pilose laterally, subapical macrochaetae indistinct; tergite 2 tricolored, basal transverse vitta brown pruinose in basal third, middle slightly narrower, transverse vitta black, apical third with gray pruinose vitta including apical margin, surface brown pilose discally, white pilose laterally; tergite 3 bicolored, basal third gray pruinose laterally, wide median black vitta narrowly reaching basal margin medially, apical narrower transverse vitta uninterrupted, includes margin, surface brown pilose on disc, margins white pilose; tergite 4 similar to 3 except that median black transverse vitta is wider; tergites 5-7 without dark markings, gray pruinose, white pilose; sternites gray pruinose, white pilose. **Terminalia: Exterior.** Piceous basally, brown apically, brown pilose throughout, nonpruinose, closed ventrally; hemitergites with dorsal margin shallowly emarginate in apical third ending in fingerlike apical projection, posterior margin deeply incised below apical projection, ventral margin evenly shallowly rounded to base; dististyles with margins gradually converging apically ending in bluntly rounded apices, upper mar-

gin bare along area overlapped by lower hemitergite margin, surface along midrib moderately brown pilose, remainder more sparsely brown pilose, ventral margin with narrow shallow transverse postmedian incision, shallowly emarginate behind incision, margins behind emargination shallowly rounded, apposed in closed terminalia; posterior margin of ninth abdominal sternite with long recumbent black dense pile extending posteriorly to posterior end of emargination posterior to postmedian marginal incision, disc of sternite sparsely brown pilose. **Terminalia: Interior.** Hemitergites with surface shiny, glabrous except for area at base of locking fold, tuberculate area anterior to locking fold in upper half of surface medium size, almost square; locking fold large, semitransparent, not heavily sclerotized, ventral and anterior margins evenly rounded, connected to posterior hemitergite margin at invagination below terminal fingerlike projection, projecting inward at a slight angle from surface, not reaching posterior or ventral hemitergite margins, base with small tuft of short black pile at junction with surface, upper connection sparsely long black pilose below margin; proctiger with lateral margins undulating toward widely expanded explanate base, strongly constricted apically to junction with narrowly expanded downward projecting area below median apical dorsal opening, lateral arms around opening short, open apically, not projecting posteriorly, laterally, or dorsally, interior of opening membranous (fig. 9); claspettes shallowly bowed laterally, widened toward apex, inner surface moderately clothed with erect golden pile, ventral subapical lobes medium in length, outer margin densely clothed with long golden pile; interbasal folds bluntly rounded apically, dorsal margin with deep rounded subapical emargination. Length 22.0 mm; mesonotal width 4.0 mm.

FEMALE: Unknown.

TYPE MATERIAL

HOLOTYPE: Male, Arizona, La Paz County (incorrectly labeled as Mojave County), June 28, 1978, P. Rude, deposited in the California Academy of Sciences, San Francisco on indefinite loan from the Essig Museum of



FIGS. 12-15. Male terminalia, claspette, dististyles, interbasal folds. Claspette. 12. *Apiocera augur*. Dististyles and interbasal folds. 13. *A. lavignei*. 14. *A. fisheri*. Dististyle. 15. *A. mulegeae*.

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DISCUSSION

ETYMOLOGY: From the Latin *constrictum* meaning to compress or constrict; in reference to the strong subapical, dorsal constriction of the proctiger.

ECOLOGY: Although no information is given on the label as to the habitat, the area 3 miles southeast of Parker is on the edge of a very large semiconsolidated and in places unconsolidated dune field known as the cactus plain. *Apiocera calida* also occurs in this dune deposit but at the base of Black Peak, known locally as "P" mountain.

RELATIONSHIPS: According to the characters used in the key, *constricta* is most closely related to *volucra*, which does not occur along the Colorado River or in Arizona. However, in *volucra* the dorsolateral margins of the proctiger are explanate subapically instead of being constricted as in *constricta*. In *constricta* the costal wing vein is white pilose in its basal third, whereas in *volucra* the entire costal vein is black pilose. From a habitat standpoint, *constricta* might be confused or found with *calida* which occupies the same dune deposit only a few miles to the north and

east. *A. calida* is a smaller and darker species that lacks the postmedian incision in the inner dististyle margin, the terminalia are open beneath, and the posterior margin of the ninth abdominal sternite does not have the long recumbent black pile (key dichotomy 1). In *constricta* the postmedian marginal incisions are present in the inner dististyle margins, the terminalia are closed ventrally, and the posterior margin of the ninth abdominal sternite has a dense patch of long black recumbent pile. In *calida* the third abdominal tergite is bicolored and tergites 5-7 are primarily black. In *constricta* the third tergite is tricolored and tergites 5-7 are densely gray pruinose. There are many other differences.

Between the cactus plain dunes and the Colorado River, seven other species of *Apiocera* can be found as follows: *pruinosa*, *intonsa*, *infinita*, *aldrichi*, *pearcei*, *caloris*, and *parkeri*. Of these species both *infinita* and *intonsa* have a dense patch of bristlelike hairs covering half or more than half of the locking folds surface, a character lacking in *constricta*. Many other characters also separate these three species. The other five species belong in a section of the genus in which the terminalia are open beneath, there is no postmedian incision in the inner dististyle margin, and there is no brush of long dense

recumbent pile on the posterior margin of the ninth sternite. In *constricta*, the terminalia are closed beneath and the other two characters are present.

Apiocera lavignei, new species

Figure 13

DIAGNOSIS: Medium-size, narrow; pteropleura sparsely white pilose anterior to metathoracic spiracles; dististyles open ventrally in apical half, inner margins without postmedian incision; posterior margin of ninth abdominal sternite without brush of long recumbent pile, lateral extensions of median posterior projection leathery in appearance, overlapping dististyles laterally for almost its entire length when closed; claspettes strongly arcuate dorsoventrally from base to apex, dorsal inner margins completely membranous, membrane widest toward base; procitiger without lateral hornlike apical projections; inner interbasal folds deeply narrowly obliquely emarginate in subapical dorsal margin (fig. 13), apex bluntly rounded; dististyles with dorsal subapical margin shallowly emarginate (fig. 13); compound eyes separated from lateral ocelli on vertex by more than half the width of a lateral ocellus.

DESCRIPTION

MALE: Head with front white pruinose and pilose, vertex between lateral and anterior ocelli brown pilose; antennal segments 1 and 2 white pruinose, pilose, and macrochaetose, segment 3 bare, dark, sparsely white pruinose basally, ending in a short acute tooth; palpi with terminal segment long, narrow, white pruinose and pilose; posterior head surface white pruinose, pilose, and macrochaetose; compound eyes separated from lateral ocelli on vertex by about the width of a lateral ocellus. **Thorax** with lateral pronotal angles gray pruinose, black pilose, and macrochaetose; mesonotum gray pruinose black pilose, lateral margins black pilose and macrochaetose, discal longitudinal vittae faint and brown pruinose; mesopleura gray pruinose, sparsely irregularly white pilose, dorsocaudal angle gray pruinose, brown pilose, black macrochaetose, pteropleura gray pruinose, with one or two white erect hairs anterior to the metathoracic spiracles; wings with costal margin

black pilose with few white hairs basally; scutellum gray pruinose, black pilose, and macrochaetose. **Legs** unicolorous piceous, gray pruinose, brown pilose, black macrochaetose, tarsi dark reddish in color, pulvilli long and narrow, about two-thirds the length of tarsal claws. **Abdomen** grayish brown, tergites 1 through 4 infuscated discally, black maculated; tergite 1 grayish brown pruinose, white pilose discally, long white and black pilose laterally, submarginal macrochaetae black; tergites 2–4 brown pilose discally, white pilose laterally, basal one-third gray pruinose, interrupted medially by brown infuscated area extending from basal to apical margins, laterally in apical two-thirds to black dorsolateral markings, dorsolateral black markings subtriangular, lower margin straight, upper margin strongly convex, anteriorly constricted to acute point, posterior margin wide, almost straight, anterior point reaching basal margin of tergites, posterior end not reaching basal margin, pleural margins with elongate narrow longitudinal dark vittae along margin; tergites 5–7 white pruinose, black and white pilose, tergite 5 with faint dorsolateral dark subtriangular spot; sternites immaculate, gray pruinose, white pilose. **Terminalia: Exterior.** Nonpruinose, piceous, black pilose. Hemitergites with dorsal margin straight to apical one-quarter, obtusely angulate downward and posteriorly to acutely pointed tip, ventral margin shallowly emarginate anterior to tip, extending to about basal two-thirds, evenly shallowly rounded to base, surface moderately densely long black pilose; dististyles elongate, dorsal margins shallowly evenly rounded to apical third, shallowly emarginate to preapical toothlike obtuse projection, more deeply emarginate from projection to bluntly rounded apex, inner margins not apposed, without postmedian transverse notch, surface sparsely long black pilose; median projection of ninth abdominal sternite convex, margins evenly rounded (apices distorted), overlapping dististyles for almost their entire length, lateral projections leathery in appearance, median surface sparsely long black pilose. **Terminalia: Interior.** Hemitergite surface shiny, tuberculate area above locking fold L-shaped, without tuft of black pile, few black hairs at inner end of locking fold at junction with

surface; locking fold attached in lower one-third of surface, upper margin straight to near tip, lower margin strongly produced ventrally below hemitergite margin covering ventral emargination, lower margin continuous with dorsal hemitergite margin at apex, fold only slightly angled away from hemitergite surface, surface without pile, membranous in appearance; proctiger in basal half with margins subparallel, apical half bent upward at about a 45° angle, little wider than basal half, margins straight, slightly converging apically, median membrane widened from base to apex, basal and apical lateral angles with short erect spines; claspettes strongly arched dorsoventrally from base to apex, apex bluntly rounded, surface glabrous except for few widely scattered short golden hairs, inner margin with membranous lining complete, widest basally, inner subapical lobes short blunt, sparsely pilose; interbasal folds with dorsal margin obliquely, deeply, subapically emarginate (fig. 13), apices bluntly rounded. Length 19 mm; mesonotal width 4 mm.

FEMALE: Unknown.

TYPE MATERIAL

HOLOTYPE: Male, Mexico: Colima?, Escamillas, May 8, 1973, Dr. R. Lavigne, deposited in the collection of the American Museum of Natural History, New York.

DISCUSSION

ETYMOLOGY: The species is named in honor of Dr. R. Lavigne, University of Wyoming, Laramie, who very generously donated the type specimen as well as several specimens of the rare *clavator*, also from Mexico; and for his fine article on the biology of the latter species (Lavigne, 1975).

ECOLOGY: According to Lavigne, in litt., "the collecting site was somewhere within two adjacent cow pastures down the hill from an old cornfield. The apiocerid was collected on a rock on the hillside."

NOTES: In the process of degreasing the specimen in acetone, after the terminalia had been opened, small white pieces of some kind of a precipitate were deposited in and on the terminalia and abdominal segments 5-7. These were small and scattered and do not obscure critical characters. Also, after com-

pleting the description I very clumsily banged into the type knocking off two legs and the terminalia. The latter have been reattached and the two legs glued on the locality label.

When first received, the specimen was found among the series of *clavator* collected a short distance away but also in Colima. It was found to be abundantly distinct from *clavator* and also from all other known species with the possible exception of *augur* which was known only from the unique type in the British Museum of Natural History, London. In 1967, the late Dr. Reginald H. Painter sent me 12 Kodachrome slides taken at various angles of the type of *augur*. Although these were not too clear, the characters that did show were found to agree with those in the single male from Escamillas and in my revision (1982), I assumed that this specimen was conspecific with the type of *augur*. The only real doubt at that time was the disjunct locality data of the two specimens. Osten Sacken gave Presidio, Mexico, as the type locality and for many years this location was assumed to be near Presidio, Presidio County, Texas. In a paper published by Selander and Vaurie (1962, p. 47) this locality from the Biologia Centrali Americana was found to be near Mazatlan, Sinaloa, Mexico. It might have been taken in a sandy area along the Rio del Presidio which is between 5 and 7 miles southeast of Mazatlan. This location is over 300 miles north of Escamillas, Colima, Mexico.

This interpretation remained unquestioned until December, 1983, when I received one male from Mazatlan, Sinaloa, Mexico, collected by B. Ryerson, August 10, 1962 which is entirely different from the Colima specimen. This male "topotype" of *augur* received from Arthur V. Evans, California State University, Long Beach, also agreed well with the external views of the holotype of *augur* taken by Dr. Painter. However, upon opening the terminalia it was found to be quite distinct from the Escamillas specimen which is thus described above as *lavignei*. The same shipment from Evans also contained four males and one female from one mile northwest of Navojoa, Sonora, Mexico, June 27, 1962, that are the same as the *augur* specimen from Mazatlan. This location is about 350 miles northwest of Mazatlan. A

request to the British Museum of Natural History for the loan of Osten Sacken's type of *augur* has not been answered.

RELATIONSHIPS: *Apiocera lavignei* belongs with a small group of species that have in common the dorsoventrally arched claspettes that have their inner dorsal margins completely membranous (fig. 12). Of the species in this group, *lavignei* appears to resemble *mulegeae* and *augur* most closely. It can, however, be separated from *augur* by its narrow, deep, oblique emargination in the dorsal subapical margin of the interbasal folds (fig. 13), by lacking the semitransparent lateral and apical margins on the upturned apical portion of the proctiger (see fig. 4), by not having the membranous inner lining on the dististyles expanded basally (see fig. 12), and by having the compound eyes separated from the lateral ocelli on the vertex by the width of a lateral ocellus. In *augur* the emargination in the subapical dorsal margin of the interbasal folds is round and transverse, the upturned portion of the proctiger is widely expanded laterally and apically by a semitransparent membranous extension (fig. 4), the inner membranous linings of the claspettes are not expanded basally, and its compound eyes are separated from the lateral ocelli on the vertex by less than half the width of a lateral ocellus.

From *mulegeae*, *lavignei* can be separated by its emarginate rather than convex dorsal subapical dististyle margins (fig. 13), its compound eyes separated from the lateral ocelli on the vertex by the width of an ocellus instead of by less than half the width as in *mulegeae*, and by its heavily infuscated abdominal tergites 1-4.

Apiocera augur Osten Sacken

Figures 4, 12

Apiocera augur Osten Sacken, 1887; pp. 212-213.

DIAGNOSIS: Medium-size, narrow; pteropleura bare (may be due to rubbed condition); terminalia open ventrally, dististyles without postmedian incision in inner margins, postmedian inner margins not apposed; posterior margin of ninth abdominal sternite without dense long recumbent black pile, posterior median projection with surface convex, lateral extensions leathery in appearance, over-

lapping dististyles laterally for almost its entire length, black pilose medially; claspettes arcuate from base to apex, inner margins completely membranous, membranes not expanded basally; proctiger without hornlike lateral apical projections, apical third turned upward at a 45° angle, upturned portion with lateral and apical wide semitransparent membranous borders (fig. 4); inner interbasal folds with large round deep transverse subapical emargination in dorsal margin; dististyles black pilose externally.

REDESCRIPTION

MALE: Head with front white pruinose and pilose, vertex between lateral and anterior ocelli sparsely brown pilose (greasy); antennal segments 1 and 2 dark, white pruinose, pilose, and macrochaetose, segment 3 (one deformed, one missing) short, dark, robust, terminating in a short acute tooth; palpi (greasy) wide, short, white pilose; posterior head surface white pruinose, pilose, and macrochaetose (greasy); compound eyes separated from lateral ocelli on vertex by less than half the width of a lateral ocellus. **Thorax** (greasy and rubbed) with lateral pronotal angles brown pilose, black macrochaetose; mesonotum brown and black pilose, lateral and posterior margins brown and white pilose, black macrochaetose, discal markings obscured; mesopleura (greasy) evidently sparsely white pilose, dorsocaudal angle bare; pteropleura bare (greasy) anterior to metathoracic spiracles; wings with costal margin white pilose basally, black pilose primarily; scutellum brown pilose, black macrochaetose. **Legs**, middle pair missing, with coxae white pilose and macrochaetose; anterior femora piceous, white pilose and macrochaetose, posterior femora piceous brown and white pilose, black macrochaetose; anterior tibiae reddish brown, white pilose, black macrochaetose, posterior tibiae reddish brown, brown pilose, black macrochaetose; tarsi reddish brown, brown pilose, black macrochaetose, pulvilli long, narrow, parallel sided, about two-thirds the length of the tarsal claws, not expanded apically. **Abdomen** with tergites 1 and 2 obscured, discs evidently brown pilose; tergites 2-4 evidently marked as in *lavignei*, largely black; pleural areas of segments 2-5 with nar-

row longitudinal dark markings along pleural suture, tergites 6 and 7 white pruinose, immaculate; sternites and pleurites 2–4 gray pruinose, white pilose, sternites and pleurites 5–7 white pruinose and pilose. **Terminalia:** **Exterior.** Nonpruinose, brown to piceous in color, black pilose throughout. Hemitergites with dorsal margin straight to apical one-quarter, gradually rounded downward and posteriorly to fingerlike apical projection, ventral margin shallowly rounded from base to subapical ventral blunt projection, deeply emarginate above this projection with margin continuing around the emargination posteriorly to fingerlike apical projection, margin of emargination and apical half of ventral margin densely long black pilose, obscuring margin and emargination; dististyles with upper margin shallowly undulating from base to bluntly rounded apices, ventral pile in apical half longer than on basal half, inner margins not apposed in unopened terminalia, margin projecting inward at middle, just posterior to lateral projections of ninth abdominal sternite; median projection of ninth abdominal sternite convex, lateral margins evenly rounded from base to inverted blunt median tip, surface leathery, overlapping dististyles for almost their entire length, apical lateral area between lateral margins and inner dististyle margins anterior to inner projections with white membranous material, median inverted V-shaped area black pilose. **Terminalia: Interior.** Hemitergite surface shiny, glabrous, tuberculate area above and anterior to locking fold rounded; locking fold without pile along junction with hemitergite surface, junction in lower third of hemitergite, fold angled outward at about a 30° angle, ventral margin undulating from base to anterior junction with subapical emargination below fingerlike apex, surface at junction broadened, densely black pilose, fold not projecting below ventral or posterior hemitergite margins. Proctiger broadly explanate basally, margins evenly rounded around elevated median basal portion, sharply constricted to narrow ridge anterior to connection with upturned portion, apical third turned upward at about a 45° angle from basal portion, extending downward and anteriorly below median connection with constricted ridge, lateral and apical margins with wide

semitransparent membranous extensions which have small spinelike projections along their margins (fig. 4); claspettes strongly arched dorsoventrally from near base to apex, inner margins with membranous lining from near base to near apex (fig. 12), apex with acute projecting point, ventral margin medially lined with medium-length golden pile hairs evenly spaced along margin, ventral subapical lobes thick, broad, concave internally, surface with few short golden hairs basally; inner interbasal folds with apex sharply pointed, extending into ventral opening between dististyles, dorsal margin deeply transversely roundly emarginate subapically; dististyles with inner apical surface turned upward nearly horizontal and onto which the apex of the hemitergites rest when the terminalia is closed. Length 20 mm; mesonotal width 4.5 mm. Redescribed from a male collected at Mazatlan, Sinaloa, Mexico, August 10, 1962, by B. Ryerson.

FEMALE: Similar to the male except for the usual secondary sexual characteristics. The dorsolateral maculations on abdominal tergite 2 are oblique and subtriangular, on tergite 3 they are oblique, narrow, longitudinal, on tergite 4 they are longitudinal, narrow, and parallel with pleural suture; the tarsal pulvilli are long, two-thirds the length of the claws, slightly swollen apically; the pteropleura are bare anterior to the metathoracic spiracles; the posterior tibiae are white pilose externally; the discal pile on abdominal tergites 2 and 3 is white; the costal wing margin is white pilose from the base to near the apex and abdominal tergite 1 is white pilose laterally. Length 18 mm; mesonotal width 4.0 mm. The characteristics given above were taken from a female specimen collected one mile northwest of Navojoa, Sonora, Mexico, June 27, 1962, by E. Sleeper, R. Anderson, A. Hardy, and R. Somerby. The four males collected at this location are like the single male from Mazatlan and are thus considered to be *augur* even though the two locations are about 350 miles apart. For additional information see notes under *lavignei*.

TYPE LOCATION: Presidio, Sinaloa, Mexico.

DISTRIBUTION: Presidio, Sinaloa to Navojoa, Sonora, Mexico, and presumably at locations in between.

VARIABILITY: Since the "topotype" specimen from Mazatlan is greasy, in spite of being immersed in acetone for 24 hours, the following additional information is taken from two male specimens from one mile north of Navojoa. The palpi are white pruinose and pilose; the lateral pronotal angles are gray pruinose; the mesonotal disc between the brown pruinose markings is gray pruinose; mesopleura gray pruinose, the dorsocaudal mesopleural angle is sparsely white pilose and black macrochaetose; the pteropleura is bare; the costal wing vein is white pilose throughout; the middle pair of legs are bicolored and white pilose, black macrochaetose; abdominal tergite 1 gray pruinose in basal third, interrupted medially by brown pruinosity that covers the apical two-thirds of the tergite, disc brown pilose, laterally long black and white pilose, submarginal apical macrochaetae black; tergite 2 with basal third brown pruinose transversely, equal width longitudinal brown pruinose vitta extending from base to posterior marginal declivity, dorso-lateral large black subtriangular markings not reaching either margin, narrowly connected to longitudinal median vitta by brown pruinosity; tergites 3 and 4 with the same maculations except they lack the basal transverse brown pruinose vitta, areas between maculations gray pruinose, discal pile brown. The abdominal maculations are similar to those of *lavignei* and are partially responsible for the confusion regarding this species and *augur* as based on photos of the type of the latter.

RELATIONSHIPS: The unique features of *augur* that will separate it from all other known species are found in the male terminalia. No other species have the long black pile on the ventral hemitergite margin along the apical exterior half of this margin, or the configuration of the apical tip of the hemitergites. However, the most important unique features are in the proctiger which has the narrow ridgelike connection between the basal portion and the upturned section (fig. 4). Also, the semitransparent membranous lateral and apical margins of the upturned apical portion of the proctiger are unique (fig. 4). In *lavignei*, with which *augur* was confused, there are sparse long black hairs along the ventral sub-apical emargination but not enough to ob-

scure the contour, the apices of the hemitergite margins do not end in a fingerlike projection, and the locking fold protrudes ventrally below the margin of the ventral emargination. Although the lateral margins of the proctiger are strongly constricted anterior to the junction with the upturned portion in *lavignei*, the constriction is abrupt and not ridgelike as in *augur*. The semitransparent lateral and apical membranous projections of the upturned portion of the proctiger in *augur* are completely lacking in *lavignei*. There are many other differences between these two species and yet they appear to be the most closely related structurally and are allopatric in their distributions.

Apiocera exta Cazier

Apiocera exta Cazier, 1941, p. 609; Cazier, 1963, pp. 230–231; Cazier, 1982, pp. 422–423.

This species was described from a single male collected in the Panamint Mountains, Inyo County, California, at a time when only 19 other species were known and before the internal structures of the male terminalia were studied and used in their classification. In 1963, pp. 230–231, the author discussed the species and mistakenly identified several series from northern Inyo County as *exta*, again prior to studies of the internal terminalia structures. In 1982, pp. 422–423, the author restudied the unique type of *exta* and the series from northern Inyo County and described the latter as *macswaini*, separating it from *exta* primarily by the shape of the lateral membranous extensions of the median posterior projection of the ninth abdominal sternite. Also in 1982, the author speculated that the type locality of *exta* was probably along state highway 190 somewhere near Townes Pass, or on the road south toward summer park headquarters of Death Valley National Monument. This assumption was based in part on the roads readily available in 1937 and the fact that in 1955 and 1968 the author traversed the valley floor from Saratoga Springs in the south to Mesquite Springs in the north and found only a new species, *hispidata*, in the valley. Both assumptions proved to be incorrect.

While the author's 1982 paper was in press and thus unavailable for additions and cor-

rections, the author received from Catherine A. Toft, Department of Zoology, University of California, Davis, a series of specimens of *exta* collected by herself at Mesquite Springs, June 28, 1978 and Ubehebe Crater, June 29, 1978. Both locations were at the northern extreme of Death Valley National Monument and at the northern end of the Panamint Mountain Range. The type locality may have been near or in one of these two locations or at nearby Death Valley Scotty's Castle, a popular and accessible tourist attraction even in 1937. Spring water is available at Mesquite Springs and Scotty's Castle and elsewhere in the valley; *hispidata* was always found in sandy areas near springs or the lake at Saratoga Springs. *Apiocera exta* may have similar ecological affinities in this area of very hot summer temperatures and dry conditions.

Since the female has previously been unknown, the following diagnostic description of a female from Mesquite Springs collected by Catherine A. Toft is presented here.

DIAGNOSIS OF FEMALE: Abdominal tergites 2 and 3 with dorsolateral irregular rounded dark spots; tarsal pulvilli narrow, about two-thirds the length of the tarsal claws; pteropleura sparse, long, white pilose anterior to metathoracic spiracles; mesopleura with dorsocaudal angle white pruinose, pilose, and macrochaetose; mesonotal marginal macrochaetae primarily black (may also be primarily white); legs bicolored, femora piceous, tibiae and tarsi reddish brown; costal wing vein primarily black pilose, white pilose at base. Length 18 mm; mesonotal width 5.0 mm.

The females of *exta* appear to be inseparable from those of *hispidata* which occurs in lower and hotter areas within Death Valley; from *pearcei* which occurs in higher areas around Death Valley; from *macswaini* which occurs in northern Inyo County, California; from *arena* which is found west and south of Death Valley; from *voragocolis* from northwest Arizona and southwest Utah, and from *varia* known only from northeast Kern County, California.

Apiocera voragocolis Cazier

Apiocera voragocolis Cazier, 1982, pp. 437-439.

This species was described from two male specimens from two locations deep within

the chasm of the Colorado River in Grand Canyon, Arizona. The holotype was taken at Indian Garden, an oasis, on the trail about midway between the South Rim and Phantom Ranch on the floor of the Grand Canyon. The paratype was collected at the confluence between the Little Colorado and main Colorado Rivers in the bottom of the Grand Canyon. This distribution has now been expanded and the female associated through material of Apioceridae received from Dr. Frank D. Parker, Logan, Utah.

This collection contained seven males and three females taken in two locations outside the Grand Canyon of the Colorado River but along tributaries of that river. One male was collected at Littlefield, Mohave County, Arizona, June 15, 1983, by W. J. Hanson, a location on the Virgin River northeast of its junction with the Colorado River at Lake Mead. Evidently *voragocolis* occurs west along the Colorado River and Lake Mead and then northeast up the Virgin River. Six males and three females were taken at Rockville, Washington County, Utah, June 19-21, 1981, by C. R. Nelson; this location is northeast of Littlefield on the North Fork of the Virgin River. The same distributional pattern is exhibited in a number of animal groups, e.g., in the beetle species *Cicindela haemorrhagica* which subspecies in the canyon, with intermediates found along the Virgin River between the canyon population of *Cicindela haemorrhagica arizonae* and the widespread *Cicindela haemorrhagica haemorrhagica*. In *voragocolis* there is no evidence of subspeciation between populations along the Colorado River in the Grand Canyon and those outside the canyon.

DIAGNOSIS OF FEMALE: In addition to the usual secondary sexual characteristics, the female is brown pilose between and in front of the ocelli; abdominal tergites 2-3 with dorsolateral triangular black markings not reaching tergite margins or each other medially, median irregular longitudinal dark marking on tergite 2 not reaching basal or apical margins, dark marking on tergite 3 reaching basal margin, not apical margin of tergite; tergite 4 with narrow median longitudinal dark marking extending from basal margin to about middle of tergite, dorsolateral dark marking round, brown pruinose, reaching basal mar-

gin, not apical margin of tergite; pleural areas of tergites 2–4 with elongate irregular dark markings; tarsal pulvilli narrow, about two-thirds as long as tarsal claws; pteropleura with moderately dense, white erect pile anterior to metathoracic spiracles; costal wing vein black pilose throughout; dorsocaudal angle of mesopleura with disc white pilose, black macrochaetose; mesonotum with lateral marginal macrochaetae black. Length 15 mm, mesonotal width 4.0 mm.

The female of *vragocolis* appears to be inseparable from those of the following four species: *exta* which is known only from Death Valley; *pearcei* which is widely distributed in southern California, southern Nevada, and northwestern Arizona (including Overton, Clarke County, Nevada, which is on the northwestern tip of Lake Mead only about 54 miles southwest of Littlefield, Mohave County, Arizona, a new location for *vragocolis*); *macswaini* which is known from Inyo and Lassen? Counties, California; and *varia* from northeastern Kern County, California.

Apiocera alleni Cazier

Apiocera alleni Cazier, 1941, p. 609; Cazier, 1982, p. 409.

This species was described from a single male specimen collected in the desert east of Victorville, San Bernardino County, California. Since 1941, additional specimens have been collected in several localities in San Bernardino, San Diego, and Riverside counties where females were found in association with the males. Such positive associations have been made in the following locations: California, Riverside County, Upper Deep Canyon at Horsethief Creek, elevation 3400 ft, June 11, 1965, M. E. Irwin; San Diego County, Culp Canyon, June 12, 1958, E. I. Schlinger.

DIAGNOSIS OF FEMALE: Medium size, robust; mesonotum with lateral marginal macrochaetae primarily black; mesopleura with disc of dorsocaudal angle moderately to densely long white pilose, sparsely white macrochaetose; pteropleura moderately to densely long white pilose anterior to metathoracic spiracles; costal wing vein predominantly black pilose, mixed black and white pilose basally; legs with femora white macro-

chaetose, tibiae black macrochaetose; tarsal pulvilli spatulate, about two-thirds the length of the claws; abdominal dorsolateral dark maculations on tergites 2 and usually 3 in the form of large irregularly shaped spots. Length 18.3 mm; mesonotal width 5.4 mm.

Apiocera haruspex haruspex
Osten Sacken

Apiocera haruspex Osten Sacken, 1877, pp. 283–284.

In my 1982 revision of the genus *Apiocera*, on p. 355, I incorrectly recorded the repository of the type as being in the British Museum (Natural History). *Apiocera haruspex* is not a Biologia species and the type is number 10662 in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.

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