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A STUDY OF LECONTE'S TYPES OF THE BEETLES IN THE  
GENUS *MONOXIA*, WITH DESCRIPTIONS OF NEW  
SPECIES

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THE genus *Monoxia* has been much neglected since its description by LeConte in 1865. The only treatments are those of Crotch,<sup>1</sup> who was able to distinguish only four of LeConte's six species, and of Horn,<sup>2</sup> who further reduced the original species to three and referred to the genus a fourth (*puncticollis* Say) belonging to a quite different group of beetles, which in an earlier paper I have referred to the genus *Erynephala*.<sup>3</sup> Jacoby<sup>4</sup> added a species from Guatemala (*semifasciata*), and Blatchley<sup>5</sup> one from Florida (*batisii*), Weise<sup>6</sup> included in his Catalogue a doubtful Fabrician species (*Galleruca atomaria* ?) from "Caroline," and I have recently described a new species (*beebei*)<sup>8</sup> from Lower California.

In the mass of material of the genus that has gradually accumulated in the U. S. National Museum, there has been little attempt to arrange or identify the species. At first a revisional study of the genus was planned, but as soon as the size of the undertaking and the

<sup>1</sup> Proc. Acad. Nat. Sci. Philadelphia, vol. 25, p. 56, 1873.

<sup>2</sup> Trans. Amer. Ent. Soc., vol. 20, p. 82, 1893.

<sup>3</sup> Journ. Washington Acad. Sci., vol. 26, pp. 424-430, 1936.

<sup>4</sup> Biologia Centrali-Americana, vol. 6, pt. 1, p. 497, 1887.

<sup>5</sup> Can. Ent., vol. 39, p. 273, 1917.

<sup>6</sup> Coleopterum catalogus, pt. 78, p. 181, 1924.

<sup>7</sup> Systema eleutheratorum . . . , vol. 1, p. 490, 1801. Fabricius described the prothorax of *G. atomaria* as margined ("marginatus") and the elytra as smooth ("laevia"), and since no species of *Monoxia* has a prothorax that can be interpreted by any feature of shape or color as margined, and all have the elytra pubescent, it seems improbable that this description could have applied to a species of *Monoxia*.

<sup>8</sup> Zoologica, vol. 22, pt. 1, pp. 89-91, 1937.

great amount of biological work necessary for an adequate understanding of the species became apparent, I decided to limit the study to a reconsideration of the forms described by LeConte and to the description of a few obviously distinct new species. In view of the preliminary nature of this paper, the key to the species here given will inevitably prove deficient in identifying specimens, since it by no means includes all the species that are likely to be collected.

The genus *Monoxia* was described by LeConte,<sup>9</sup> who assigned to it the following species: *Galleruca consputa*, *G. guttulata*, *G. sordida*, and *G. angularis*, all previously described by himself, and the new species *M. obtusa* and *M. debilis*. Because it is one of the largest and easiest to recognize of the species originally included in this homogeneous group, I hereby designate *M. angularis* as the type of the genus *Monoxia*. LeConte in his key to the Galerucinae of North America separated *Monoxia* from related genera by the character of the claws, which he described as acute and usually entire. He states that the genus is made up of "small testaceous species densely clothed with yellow hair, and easily recognized by the ungues being neither cleft nor appendiculate," but "slender, acute, not toothed, nor dilated at base, in one section, and with a small acute tooth not divergent as in *Galleruca* in the second section. The deflexed pygidium readily distinguishes this genus, and gives to the ventral surface somewhat the appearance observed in genera allied to *Clythra*." Crotch added to LeConte's description by observing that the claws of the male are finely toothed and those of the female simple. Horn pointed out as the defining characters of the genus the open anterior coxal cavities and the dimorphous claws, bifid in the male and simple in the female. Horn makes little of the vertical pygidium, remarking that while it is more or less vertical in the male of the small species, it is not different from other Galerucinae in the large species or in the female. Horn was correct in saying that the pygidium of the female is not vertical. He distinguished *Monoxia* from *Galerucella* by its shorter antennae.

On account of the difference in the claws of the male and female, Weise has placed *Monoxia* in the subfamily Apophylliini, a group composed of African and Asiatic genera and far removed from *Galerucella*. A study of the claws of the different species of *Monoxia* shows that those of the female are not always simple but are sometimes toothed and indistinguishable from those of the male. This is the case in at least four species, and while three of the species with this character form a group somewhat unlike the other species of *Monoxia*, the remaining one is so closely related to the other species of the genus that I can scarcely distinguish it except by the toothed claws of the female. Except for its family likeness, the only resemblance *Monoxia* bears to the other genera of the subfamily Apophylliini is the difference in

<sup>9</sup> Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 221, 1865.

the claws of the sexes in the majority of the species, and its inclusion in this subfamily is purely artificial.

Although *Monoxia* is an easily recognized, homogeneous group of species occurring chiefly in western North America and having, so far as is known, the distinctive larval habit, peculiar among closely related genera, of mining leaves, it is exceedingly difficult to find characters that in all cases will separate it from *Galerucella*. Generally the claws of the male are toothed and those of the female simple, but not always. Generally the antennae of *Monoxia* are shorter, but even here it is extremely difficult at times to draw a line. Usually, the prothorax is longer and more deeply impressed and the elytra narrower and with a less broadly rounded apex and a narrower lateral margin, and the abdomen of the male has a "deflexed pygidium," but certain species of *Galerucella* are as narrowly oblong as *Monoxia*, and at least four species of *Monoxia* do not have a very evident pygidium in the male.

#### DESCRIPTION OF THE GENUS

The body is elongate-oblong-oval, more or less densely pubescent with short, fine, and usually recumbent hairs. The head is withdrawn into the prothorax to behind the eyes; it is moderately wide, very little produced in the lower front, and with a median impressed line; there is little evidence of frontal tubercles, and the upper part of the head is punctate and pubescent. The antennae are short, not half the length of the body, and do not come much below the elytral humeri. The first and third joints are longest, the fourth and remainder, except the apical one, about the same length, gradually thickening. In the male, the joints are slightly longer and slenderer, while in the female the eighth, ninth, and tenth joints frequently are thicker. The prothorax is usually scarcely twice as broad as long, often considerably less, and only in one group of species over twice as broad as long; the sides are arcuate or angulate, sometimes nearly straight, but usually broadest in the middle, with a little tooth at the basal angle, more or less prominent in different species. The basal margin is usually sinuate over the scutellum and joins at an obtuse angle with the sides. The upper surface is uneven and has a median channel and lateral depressions. In some species these depressions are very pronounced, in others a mere unevenness of surface. The surface is generally densely punctate and pubescent. The scutellum is truncate. The elytra are broader than the prothorax, with parallel sides and a narrow margin which extends nearly to the tip; the humeri are prominent, and there is often a long incurving intrahumeral depression extending to behind the middle. In some species there is also a linear lateral depression behind the middle. The surface is more densely and finely punctate than in most species of *Galerucella* and

more or less pubescent. As in *Galerucella*, there are often traces of one or two raised lines on the inner half of the elytra, parallel to the suture and particularly evident in the basal half. The epipleura do not extend to the apex. Beneath, the body is finely pubescent. The prosternum disappears between the anterior coxae, and the precoxal cavities are open. Usually the tip of the abdomen appears truncate in the male, owing to the pygidium coming down and meeting the concave last visible sternite much like the flap of an envelope. In the female the pygidium is less in evidence, and the tip of the abdomen is more oval. In some species, as in the *sordida* group, and also in *M. batisii*, this development of the pygidium in the male is not so striking and the two sexes are not easily differentiated by it. The legs are without spurs or teeth and the tibiae are glabrous on the outer edge. The claws are toothed in the male, but usually simple in the female.

In one group of species, consisting of *sordida* and two closely related species, the claws are toothed in both sexes. These species are also peculiar in having a short, wide prothorax, over twice as wide as long. Furthermore, the abdomen of the male in most specimens is not so truncate as in the other species. These peculiarities make the group somewhat intermediate in character between the genera *Monoxia* and *Galerucella*. Besides these three species, another species, described here as *Monoxia schizonycha*, has the claws toothed in both sexes, but in other characters it is similar to *M. consputa* and others in which the claws are dimorphous. The abdomen of the male of *M. schizonycha*, also, is truncate, as in the majority of the species.

The aedeagus of all the species is a simple bowed structure. In some it is short, broad, and with a well-rounded tip; in others, long, narrow, and tapering acutely to the tip. Frequently the aedeagus varies somewhat in specimens of a species from different localities. The general structure and shape are the same, but sometimes there is considerable diversity in the length or in the shape of the tip or in the position of the dorsal opening. This is most marked in species having a wide range (as in *sordida*, which occurs in eastern Texas and Western United States) and has led me to doubt if the eastern colonies are the same as the western. In such cases more biological work is necessary before any conclusion can be reached. Even in a series from a single locality there is considerable variation, and in some cases, among groups of closely related species, the aedeagus does not afford good distinctive characters.

The color and markings vary so as to be exceedingly misleading. In almost every species is found a gradation from pale forms, often without any markings whatever, through various stages to heavily marked. In fact, it is rather rare to find two specimens of a species marked

alike. There is a certain typical pattern, traces of which occur in practically every species of *Monoxia*. When moderately developed it consists of humeral, sometimes lateral, and usually subsutural infuscations. From the slightly darkened sutural edges at the scutellum, again before the middle, and sometimes again before the apex, a darkened branch curves outward about a quarter of the way across the elytron and then, in the case of the upper two branches, curves downward parallel to the suture. The apical branch when present usually enlarges at the end and often joins with the lateral darkening. In the majority of the specimens, the suture is pale and only the ends of the branches, running parallel to the suture, remain, forming what has been described as the interrupted subsutural vitta. In certain heavily marked specimens, on the other hand, the sutural and subsutural vittae unite to form a wide, dark vitta common to both elytra. In others, as in *sordida*, the branches take the form of rounded lobes. In many all that remains of the branches is a series of spots in a line, suggesting a vitta. Finally these spots may disappear, leaving the elytra pale. The humeri are usually darkened and an indefinite lateral darkening often occurs. Between this and the subsutural vitta are irregular spots, often in a series. Although the elytral pattern is fundamentally alike in all species, some tend to be paler, for example, certain Arizona species of arid areas, and some tend to be more darkly marked.

The question has been raised whether the species of this genus are not in too active a stage of evolution to justify an attempt to reduce them to order. For instance, in LeConte's species *M. consputa*, *angularis*, and *sordida* specimens from different localities show appreciable differences in minor features. This variation may indicate that these species are still in the process of active evolution. It is possible, however, to distinguish LeConte's species as variable units, but at this stage of our knowledge of the genus it does not appear advisable to do more than to describe the variation in the characters of these species without distinguishing the forms by name. The attempt to establish finer distinctions within the limits of these species should be based on further study along biological lines. Other species, such as *M. schizonycha*, *puberula*, and *apicalis*, are more constant and clearly defined. For the differentiation of the species, the pubescence and punctation, together with the shape of the prothorax and aedeagus, and the presence or absence of depressions on the elytra prove important characters.

In this homogeneous group there is the greatest need for careful biological study and the correlation of host plants. Apparently the species may be roughly divided into two classes according to their food plants, those feeding on Chenopodiaceae, both the wild *Cheno-*

*podium* and its cultivated relative, sugar beet, and hence of importance economically, and those feeding on Compositae, such as *Artemisia*, *Chrysothamnus*, *Grindelia*, and *Gutierrezia*. In addition to these food plants one species is recorded by Profs. R. A. Cooley and E. O. Essig as injuring cottonwood. In general, the beetles feed on desert and salt marsh plants, and because of their occurrence in such regions they have become popularly known in the Western United States as "alkali bugs." They are found from the Pacific coast eastward to western Texas, Kansas, Nebraska, the Dakotas, and Alberta. At least four species have been collected along the coast of southeastern Texas. Only one is known from farther east, *M. batisii*, which has been collected in Florida by W. S. Blatchley on *Batis maritima*, a shrub occurring about the Gulf of Mexico and north to North Carolina. *M. batisii* is also found in Texas (San Patricio County, Corpus Christi, Brownsville) and Mexico (one specimen in the collection of the Illinois State Natural History Survey from Tampico). As yet, only a few species are reported from Mexico, but it is probable that many of the southwestern species will be found there.

I wish to thank the following entomologists for their courtesy in lending their private collections or the collections in their charge: Nathan Banks, Museum of Comparative Zoology; K. G. Blair, British Museum; Warwick Benedict, University of Kansas; Prof. Melville H. Hatch, University of Washington; Prof. William A. Hilton, Pomona College; S. C. McCampbell, Colorado State College of Agriculture and Mechanic Arts; G. A. Mail, Montana Agriculture Experiment Station; Dr. H. H. Ross, Illinois State Natural History Survey; Prof. H. C. Severin, South Dakota State College; Prof. E. C. Van Dyke, California Academy of Sciences; H. R. Brisley; the late F. S. Carr; D. K. Duncan; C. A. Frost; Ralph Hopping; H. Lan-  
chester; M. C. Lane; and A. T. McClay.

#### KEY TO SPECIES OF MONOXIA

- |  |                                  |
|--|----------------------------------|
| 1. Claws in both sexes toothed.....  | 2                                |
| Claws in female simple, in male toothed.....   | 5                                |
| 2. Head without pronounced median vertical depression; prothorax<br>not twice as broad as long; elytra strongly and moderately<br>coarsely punctate; beetles medium sized (3.5 to 4 mm.) |                                  |
|  | <i>schizonycha</i> , new species |
| Head with pronounced median vertical depression; prothorax<br>short and fully twice as broad as long; elytra finely punctate;<br>beetles tending to be smaller (2.5 to 3.8 mm.).....     | 3                                |
| 3. Densely pubescent, punctuation on elytra hidden; apex of<br>aedeagus seen from above broad with a short, pointed tip. <i>sordida</i> LeConte  |                                  |
| Less densely pubescent, elytral punctuation distinctly visible;<br>apex of aedeagus seen from above narrow and gradually tapering<br>to a point.....                                     | 4                                |

4. Elytra usually darkly marked with transverse dark areas at base, at middle, and near apex at the suture, apex pale; aedeagus rather short and stout with a fine, narrow tip. *apicalis*, new species  
Elytra usually without heavy sutural darkenings; aedeagus long, slender, and tapering..... *brisleyi*, new species
5. Aedeagus long and slender, with a dorsoventrally flattened apex..... 6  
Aedeagus shorter and robust and not with a dorsoventrally flattened apex..... 10
6. Beetles large (4 to 5.3 mm.)..... 7  
Beetles smaller (2 to 4 mm.)..... 8
7. Pronotum with prominent hind angles; Western United States, feeding on Chenopodiaceae..... *angularis* LeConte  
Pronotum without prominent hind angles; Florida, southeastern Texas, and eastern Mexico, feeding on *Batis maritima*... *batisii* Blatchley
8. Narrowly oblong, slender, prothorax with lateral sides angulate at middle, disk uneven with lateral and median depressions..... *minuta*, new species  
More broadly oblong, prothorax with lateral sides arcuate and disk more smoothly convex with only slight depressions..... 9
9. Aedeagus unusually long, elytra finely and shallowly punctate; southeastern Texas..... *obesula*, new species  
Aedeagus not unusually long, elytra rather coarsely and distinctly punctate; Colorado, Idaho..... *pallida*, new species
10. Aedeagus very broadly rounded, almost truncate at apex when viewed from above..... *elegans*, new species  
Aedeagus more or less tapering, sometimes acute at apex when viewed from above..... 11
11. Medium sized (3 to 4 mm.), with rather scant, short pubescence or with fine, silken pubescence, not deeply punctate..... 12  
Larger (3.5 to 5 mm.), conspicuously pubescent and coarsely punctate..... 14
12. Elytra without long intrahumeral sulcus, with scant, short pubescence and finely punctate, somewhat shining; feeding on *Gutierrezia*..... *puberula*, new species  
Elytra sometimes with a long intrahumeral sulcus, either covered with a fine silken pubescence or not shining but distinctly punctate..... 13
13. Elytra depressed, with a conspicuous deep intrahumeral sulcus, not densely pubescent, punctuation quite visible and distinct..... *conspuata* LeConte  
Elytra not depressed, with a shallow intrahumeral sulcus, elytral punctuation somewhat concealed by fine, dense pubescence; Lower California..... *beebei* Blake
14. Elytra with a long intrahumeral sulcus, pubescence long and not closely appressed but erectish; vicinity of San Francisco, feeding on *Artemisia*..... *guttulata* LeConte  
Elytra with only a short intrahumeral sulcus, pubescence closely appressed..... 15
15. Elytra shallowly and very densely punctate, aedeagus viewed from above rather abruptly contracted into a somewhat blunt, wedge-shaped apex; feeding on *Grindelia*..... *inornata*, new species  
Elytra deeply and more coarsely punctate, aedeagus usually longer and gradually narrowed at apex..... 16

16. Prothorax little depressed, the width considerably less than twice the length; elytral punctation markedly coarse and distinct; Rocky Mountains and Great Plains..... *debilis* LeConte  
 Prothorax wider and more depressed on the sides, dense grayish elytral pubescence somewhat obscuring the coarse punctation; aedeagus long and heavy; Montana, Idaho, Alberta, feeding on *Artemisia* and *Solidago*..... *grisea*, new species

MONOXIA CONSPUTA (LeConte)

PLATE 19, FIGURE 18

*Galleruca consputa* LECONTE, Reports of explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean, vol. 9, No. 1, p. 70, 1857.

*Monoxia consputa* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 222, 1865.—HORN, Trans. Amer. Ent. Soc., vol. 20, p. 85, 1893 (in part).

LeConte's Latin description of *Galleruca consputa* may be translated thus: Elongate, yellow-testaceous, pubescent, densely and not finely punctate, with a median black line down the head, the prothorax canaliculate and impressed here and there near the sides, with a black dorsal vitta and a dark lateral clouding; the elytra with an oblique intrahumeral depression and another depression along the sides from the humerus posteriorly, with elevated black suture and numerous small black spots, the undersurface fuscous, the legs testaceous, black-spotted. Length 0.15 inch. The type locality is given as San José, Calif., in his original description, although later the localities San José and San Francisco are both given. He states that it occurs on oak leaves. It is described as narrower than *G. debilis*, with the elytra more coarsely punctate, the sides compressed and impressed, and the disk obliquely impressed behind the middle.

In the LeConte collection are five specimens, all with the gilt label indicating the locality California, the first of which, a male, is labeled *consputa*, locality San José, Museum of Comparative Zoology type No. 4386. Although it is rather difficult to see the claws, I believe all four others are males with toothed claws. All are similarly marked and correspond with LeConte's description. The head is more or less darkly speckled on the lower front, with a dark streak above the antennal sockets and also below, and the median line and labrum are dark. The pubescence is long, moderately dense, and covers the punctation on the occiput. The antennae have darker and thicker apical joints. The prothorax is nearly twice as wide as long and has median and lateral depressions, not so deep as in *angularis* or *guttulata*, the sides somewhat rounded, the basal angles not prominent, and the pubescence not dense, showing beneath it the shallow, rather coarse punctation. The elytra have the humeri well marked, with a pronounced and long incurving intrahumeral depression, and there is also a distinct postmedian lateral depression, running from the side



obliquely toward the apex. The punctation is rather coarse and dense, becoming finer toward the apex, and the pale pubescence is moderately long, recumbent, not dense, and not obscuring the punctation. Beneath, the body is dark except the last two or three abdominal segments, and the legs are speckled.

Compared with the other species described by LeConte, *consputa* stands out as being next in size to the tiny *sordida*, that is, one-third smaller than *angularis* and considerably smaller than *guttulata* or *debilis*. *M. consputa*, besides being smaller than *angularis*, has a differently shaped prothorax, the basal angles of which are not conspicuous, shallower elytral punctation, and a quite differently shaped aedeagus. Compared with *guttulata*, it is not only less elongate and smaller, but the pubescence is shorter and less conspicuous and more closely appressed. Unlike *debilis*, the elytra are not convex but have pronounced depressions. Among the medium-sized species it is distinctive because of the coarse elytral punctation. The majority of the specimens examined are darkly marked, with the head speckled, the prothorax with an M-shaped configuration, and the elytra with a darkened sutural vitta.

Specimens of this species from about San Francisco (Mount Tamalpais and Monterey) correspond entirely with LeConte's types. On the other hand, there are many specimens from other localities throughout the Western States and in Texas that closely resemble *M. consputa* but have slight differences. In all the aedeagi are very similar. Whether these are varieties of a single species or are specifically distinct is not clear. As in some other species, notably in *M. sordida*, the status of these closely related forms cannot at present be satisfactorily worked out. Possibly as a species *M. consputa* is not yet fixed but still in the process of evolution. A series of specimens from Beaver Creek, Utah, is slenderer and has shorter pubescence. Another series that I collected in numbers on *Chrysothamnus nauseosus* in Yellowstone Park, Wyo., is slightly larger, with a little coarser elytral punctation and with inconspicuous pubescence. A single specimen from Williams, Ariz., similar to typical specimens in elytral punctation and depressions, is more pubescent. A series from Ritzville and Toppenish, Wash., is more pubescent and darker in coloring.

MONOXIA GUTTULATA (LeConte)

PLATE 19, FIGURE 13

*Galleruca guttulata* LECONTE, Reports of explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean, vol. 9, No. 1, p. 70, 1857.

*Monoxia guttulata* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 222, 1865.

*Monoxia consputa* HORN, Trans. Amer. Ent. Soc., vol. 20, p. 85, 1893 (in part; not LeConte, 1865).

LeConte's Latin description of *Galleruca guttulata* may be translated thus: Elongate, fuscous-testaceous, strongly cinereous pubescent, densely and strongly punctate, with the short prothorax widely canaliculate and uneven near the sides; elytra widely sulcate within the humeri, obliquely impressed near the margin, with sparse, subserrate, round black spots. Length 0.19 inch. One specimen only is cited, and the type locality for that given as San Francisco. Compared with *consputa*, *M. guttulata*, according to LeConte, is larger and the suture is not elevated and not dark.

In the LeConte collection is a single female, with simple claws, without doubt the one from which LeConte drew up his description, which bears the label *guttulata* and a gilt circle indicating the locality California. It has also the Museum of Comparative Zoology type No. 4384. The head is pale below, gradually darkening to deeper yellow on the occiput, and the labrum and median line, which is not much impressed, are dark. The pubescence is moderately long and dense and conceals the occipital punctation. The four basal joints of the antennae are pale and the remaining ones darker. The prothorax is depressed in the middle and on the sides; the basal tooth is small and not conspicuous; the pubescence long and appressed, nearly concealing the dense punctation below. The elytral humeri are prominent, with a long incurving intrahumeral depression extending a third of the way down the elytra and a less marked postmedian lateral one. The punctation is coarse, very dense, and partly concealed by the dense, long, erectish, grayish-yellow hairs. The elytral markings consist of small dark spots. Beneath, the legs are pale, the metasternum and first abdominal segments dark and shining under the fine, dense pubescence.

The most striking characteristic of *guttulata*, distinguishing it from any of the other large species, is the long and somewhat erectish elytral pubescence together with the conspicuous, long, intrahumeral depression. *M. guttulata* is a little smaller than *angularis* and has a different kind of elytral punctation, the punctures appearing rounder and the surface less honeycombed than in *angularis*, and the pubescence is long and not closely appressed as in *angularis*, and the antennae are slenderer. *M. consputa* is smaller and not so pubescent. *M. debilis* does not have the striking intrahumeral depression although similar in its elytral punctation and *debilis* also has a longer prothorax. The aedeagus of *guttulata*, similar in shape to that of *consputa*, is longer. The majority of the specimens examined are heavily marked with spots, often appearing nearly black. Thus far I have seen specimens only from the region about San Francisco: Carmel, Monterey, Ross, Lagunitas (Marin County), Los Gatos. Dr. E. C. Van Dyke has collected it in numbers on a species of *Artemisia*.

## MONOXIA SORDIDA (LeConte)

## PLATE 18, FIGURE 6

*Galleruca sordida* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 10, p. 88, 1858.

*Monoxia sordida* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 210, 1865.—HORN, Trans. Amer. Ent. Soc., vol. 20, p. 86, 1893.

LeConte's Latin description of *Galleruca sordida* may be translated thus: Testaceous, covered with dense, pale, sordid pubescence, the head canaliculate, the prothorax short with subangulate sides, deeply canaliculate and depressed ("late excavato") on either side; the elytra somewhat 3-sulcate, the second sulcus directed obliquely inward forward, the third very short; the elytra marked at the middle by a common slightly impressed dark sutural spot, and by several spots especially near the middle; the antennae less than half the length of the body, a little thickened outwardly; the breast fuscous. Length 0.13 inch. The type locality is given in the original description as Fort Yuma, Calif., and in a later publication as the Colorado Desert, Calif., and the number of specimens as two. In the earlier publication *sordida* is said to be related to *G. guttulata* but to be more finely punctured and still more densely pubescent, so that the punctures are not visible. Later LeConte compared it with *G. consputa*, but here also the elytra are said to be more finely punctured and the punctures almost concealed by the dense golden pubescence.

In the LeConte collection are two specimens, both with round gilt labels indicating the locality as California. The one bearing the label *sordida* and the Museum of Comparative Zoology type No. 4387 has also the abbreviation "Col." meaning probably Colorado Desert. It is the more heavily marked specimen. The second specimen is pale yellow-brown with only a faintly marked median sutural spot. The head in both has a pronounced median depression, more marked than in the other species described by LeConte. The prothorax is shorter and broader, tending to be more rectangular in shape than in the other species, and more deeply and widely depressed on the sides. The elytra are by far the most densely pubescent of any of those hitherto described, the fine, recumbent pubescence entirely concealing the punctation. The abdomen in both is so shriveled that it is impossible for me to determine the sex. These two specimens without doubt are the ones from which LeConte drew up his description.

In LeConte's description of the species he placed emphasis on the dense pubescence, and this character makes it perhaps the most readily recognizable of the genus. The thick silken pubescence gives the elytra the appearance of being plushy. *M. sordida* is also one of the smallest species (2.6 to 3.8 mm.) and has a distinctive, short, broad prothorax, twice as broad as long and sometimes more so, in contrast with that of the other species in which the prothorax is either less

than twice or barely twice as broad as long. The shape of the prothorax places this species, together with two hitherto undescribed ones, *apicalis* and *brisleyi*, in a separate group. These three have another point in common—the claws are not simple in the female, as in most species of *Monoxia*, but have a small tooth, making them indistinguishable from the males in this respect. The abdomen of the male does not appear so truncate as in most species of *Monoxia*. The only other species of the genus known to the author having this latter characteristic is the eastern *M. batisii*, which also somewhat resembles the *sordida* group in the shape of its prothorax. *M. batisii*, however, has simple claws in the female.

As in most species of the genus, there is great variability in markings. Some specimens are entirely pale or with only faint reddish-brown spots, while others are heavily and darkly marked. The Texas specimens are large and have unusually long pubescence. Possibly these eastern colonies represent a different species or subspecies. Some of the Arizona specimens are also large, and are very dark, while others are tiny and pale, resembling the Colorado Desert specimens of LeConte. While the general shape of the aedeagus remains the same in all, there is considerable variation in this structure even in a series from a single locality. More study of a greater amount of material is necessary before the status of this widespread and variable species can be satisfactorily worked out.

In Arizona a small pale series has been reported as feeding on *Gutierrezia sarothrae*, "the larvae and adults equally severe in destroying the foliage completely in some badly infested areas" (C. N. Ainslie). H. R. Brisley has collected a large dark series on *Lycium pallidum* in Arizona, and another specimen, much smaller but also dark, on *Gutierrezia sarothrae*. At Thermal, Calif., H. O. Marsh bred a small dark series on *Dondia* sp. Dr. E. P. Van Duzee, at the type locality, collected typical specimens on *Atriplex lentiformis*.

Specimens have been examined from Texas (Brownsville, Del Rio, Corpus Christi, Sabinal), Arizona (Catalina Springs, Santa Rita Mountains, Oracle, Tucson, Tempe, Winslow), Utah (Salt Lake, Kelton, Cisco), Colorado (Delta, Rocky Ford), Nevada (Humboldt Lake), California (Fort Yuma, Thermal, Los Angeles, San Diego, Needles), Baja California (Agua Verde).

MONOXIA ANGULARIS (LeConte)

PLATE 18, FIGURE 2

*Galleruca angularis* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 11, p. 90, 1859.

*Monoxia angularis* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 221, 1865.

*Monoxia consputa* HORN, Trans. Amer. Ent. Soc., vol. 20, p. 85, 1893 (in part; not LeConte, 1865).

LeConte's Latin description of *Galleruca angularis* may be translated thus: Above ochreous, densely pubescent, densely and not finely punctate, with the prothorax uneven, almost twice as broad as long, anteriorly and posteriorly transversely impressed, canaliculate, with sides oblique, rounded, at base sinuate, the posterior angles with acute prominences; the elytra with an infusate lateral vitta and small remote spots in a triple series; the body beneath black, the legs yellow, and antennae fuscous. Length 0.22 inch. In a later description he gave the locality as "California near San Francisco? given me by Mr. S. S. Rathvon" and stated that the elytra are finely and densely punctured and not depressed and that the species is easily distinguished by the very prominent angles of the prothorax. He differentiated it from *guttulata* by the form of the prothorax and by the black elytral dots being arranged in series.

In the LeConte collection there are six specimens under this name, one of which bears LeConte's label and the Museum of Comparative Zoology type No. 4382. Of these six specimens two have gilt labels indicating the locality California, three are labeled California and have dots such as Crotch and Casey used, and the last specimen is labeled "S.III." The specimen bearing LeConte's label *angularis* corresponds entirely with his description. It is a female, approximately 5.3 mm. long, with simple claws. The head is pale and covered with dense gray pubescence. A dark median line, somewhat impressed, extends down the front. The tip of the mandibles is also dark. The antennae are pale at the base with darker and thicker apical joints; the third joint is scarcely twice as long as the fourth. The prothorax is not quite twice as wide as long, with arcuate sides and prominent basal angles on which is a blunt tooth. The disk is depressed in the middle and on the sides, coarsely and densely punctate, with short, closely appressed pubescence not concealing the punctures. In color it is pale yellow-brown, with faint reddish-brown markings on the sides. The elytra are considerably wider than the prothorax, without marked depressions. The humeri are prominent, the punctation dense, rather coarse and deep at base, and toward the apex becoming finer and shallower. The pubescence is fine, short, and closely appressed without concealing the punctures. Beneath, the body is dark except the last abdominal segments, which are paler on the sides, the last segment being almost entirely pale. The legs are pale. The second specimen, a female, nearly a third smaller (4 mm.), differs from the first by not having the basal angles of the prothorax prominent and by lacking the lateral dark vitta on the elytra and is not the same species. The remaining specimens are all similar to the first and without doubt the same. It seems probable that LeConte had only one specimen at the time that he made his original description, since the

second specimen does not agree with it and since he does not mention the other localities.

LeConte gave as the distinguishing mark of this species the prominent posterior angles of the prothorax, a character that is usually pronounced in this species. This prominence of the basal angles is due primarily to the width of the prothorax, coupled with the unusually well developed tooth and the deep incurvation below the tooth on the basal margin. The prothorax is wider than in many species, being nearly twice as wide as long, and covered with short appressed pubescence. It is somewhat irregularly depressed on the sides both at the base and apex. The elytra are broadly oblong, with a short intrahumeral depression, but this is not so long or so pronounced as in *guttulata* or *consputa*, and the punctation is not so shallow as in those two species. The pubescence, shorter than in *guttulata*, differs also in being fine and closely appressed. The apical joints of the antennae are usually stouter than in any other species of *Monoxia*. Besides having rather prominent basal angles of the prothorax, it is still further distinguished by being one of the largest species, the length ranging from 4.5 to 5.3 mm. and the width from 2 to 2.5 mm. It is much larger than *consputa* with which Horn synonymized it. The aedeagus is longer than that of any of the other large western species except *M. grisea*, which has a thicker and heavier aedeagus. The aedeagus of *angularis* resembles somewhat that of *M. batisei* Blatchley, a quite different species occurring in Texas and Florida.

As in both *M. consputa* and *M. sordida*, there appear to be various closely related forms or races of *angularis* from different localities. Along the Pacific coast, from California to British Columbia, the specimens have rather scanty, closely appressed, and inconspicuous elytral pubescence with the punctation beneath distinctly visible. Specimens from eastern Washington (Elk, Pullman, Ritzville), on the other hand, have moderately dense elytral pubescence, and the prothorax is not so depressed on the sides. Specimens from Idaho, Montana, Wyoming, Utah, and Colorado have still denser elytral pubescence, which almost conceals the punctation beneath. In these the prothorax appears wider and less depressed on the sides, with the basal angles more prominent. In all the specimens examined from various localities, the aedeagus is similar in being long, curved, and slender. The tip, however, in specimens from eastern Washington, Idaho, Montana, Utah, and Colorado is wider than in specimens from the Pacific coast and somewhat wedge-shaped. It is possible that with fuller knowledge of their biology, the specimens from the eastern part of its range may prove to represent one or more distinguishable subspecies.

*M. angularis* is one of the most abundant species of the genus throughout the Pacific and northwestern States, but apparently does

not occur in Arizona and New Mexico. It has been collected frequently on *Chenopodium album* and sugar beet (*Beta vulgaris*), and in Colorado and Montana the beetles have been reported as damaging sugar beets.

*Distribution.*—British Columbia (Creston, Merritt, Rykerts, Trinity Valley, Vernon); Washington (Elk, Medical Lake, Pullman, Ritzville, Spokane Falls, Yakima); Oregon (Corvallis, Forest Grove, Huntington); California (Amadee, Grant Forest, Tulare County; Isabella, King City, Los Angeles; Meadows Valley, Plumas County; Mill Creek Canyon, San Bernardino County; North Hollywood, Pomona, Sacramento, San Joaquin Mill, San José, Shasta County, Sprekels); Idaho (Blackfoot, Bliss, Bonners Ferry, Cabinet, Cascade, Challis, Clarks Fork, Clayton, Council, Driggs, Emmett, Headquarters, Heron, Kura, Lowman, Nampa, Parma, Porthill, Rexburg, Shoshone, Solomon, Twin Falls); Montana (Armstead, Bozeman, Grantsdale, Carlos Mountains, Florence, Hamilton, Musselshell County, Paradise, Plains, Whitehall); Wyoming (Corbett, Jackson, Lake McElroy, Paha); Colorado (Alamosa, Antonito, Colorado Springs, Delta, Fowler, Glen Springs, Gunnison, Gypsum, Hotchkiss, Manitou Park, Paonia); Nevada (Carson City, Lovelock); Utah (Beaver Valley, Bountiful, Coalville, Joseph, Lehi, Ogden, Salt Lake); North Dakota (Williston); "Kentucky"; "S. Ill." (these last two probably not correctly labeled).

## MONOXIA DEBILIS LeConte

## PLATE 18, FIGURES 7, 8

*Monozia obtusa* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 222, 1865.

*Monozia debilis* LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 222, 1865.—HORN, Trans. Amer. Ent. Soc., vol. 20, pp. 85, 86, 1893.

In LeConte's paper both *obtusa* and *debilis* are described on the same page, the description of *obtusa* preceding that of *debilis*. Horn when uniting them selected the name *debilis*, and his choice is valid under Article 28 of the International Rules of Zoological Nomenclature.

LeConte's Latin description of *debilis* may be translated thus: Pale testaceous, densely covered with pale pubescence, the prothorax less than twice as broad as long, with rounded sides, the posterior angles with a minute tooth, the disk densely punctate, canaliculate, and on each side depressed here and there in places; elytra wider than the prothorax, deeply punctate, the punctures stronger anteriorly; transversely convex and each elytron ornamented with small black spots in a fourfold series; antennae fuscous on the outside. Length 0.15 to 0.18 inch. The type locality is given as "N. M. Mr. Ulke." The pubescence is dense and somewhat silvery; the black dots of the

elytra are minute, and those of the subsutural series usually coalesce, forming a narrow, abbreviated line; the humeri are prominent and marked with a larger black spot.

In the LeConte collection is a series of five specimens all labeled "N. M.," the one bearing the label *debilis* being a male with toothed claws. It also bears the Museum of Comparative Zoology type No. 4385. Of the remaining four, two are males and at least one is a female with simple claws. Three of these four are without doubt the same species as the first, but one, a male, which is slenderer and less densely punctate and pubescent, belongs to a different species. It is probable that LeConte did not have before him this entire series when writing his description, since one, a female, does not answer his description of the species as having toothed claws, and another one, with sparser pubescence, is obviously unlike his description (see p. 166). The one bearing the label and the two males like it are similar in coloring. The female has darker markings—the prothorax has two lateral spots and a median streak uniting anteriorly to form an M-shaped figure, and the elytra have the suture dark and the spots coalescing in places to form interrupted vittae, and the under surface is nearly dark with the exception of the last abdominal segments. In the paler male specimens the prothorax is unmarked or only faintly marked, the elytra have less continuous spots, and the mesosternum, metasternum, and first abdominal segments are in part darkened. The head in all four is without prominences; the median line is not much impressed; the pubescence is dense but not long and covers the occipital punctation; the color is pale, deepening on the occiput, but the labrum and median line are dark. The antennae have slightly darker reddish-brown and thicker outer joints. The prothorax has well-rounded sides and is not greatly depressed in the middle and on the sides; the basal tooth is small; the pubescence is dense but not long, obscuring the dense punctation beneath. The elytra are convex with only a short intrahumeral depression and have deep and coarse but distinct and not confluent punctures, becoming finer and shallower at the apex. The pubescence is conspicuous in being moderately dense and of a pale silvery color, but not long.

LeConte's Latin description of *obtusa* may be translated thus: Testaceous, with pale pubescence, the prothorax strongly and densely punctate, less than twice as broad as long, with the sides rounded, the posterior angles obtuse, with a small tooth at the apex, the disk canaliculate and on both sides widely impressed; the elytra densely punctate, the punctures stronger anteriorly; the outer edge of the antennae and the breast and abdomen infusate. Length 0.20 inch. He based his description on three specimens, one from Andover, Mass. (Mr. Sanborn), and two from Kansas. He distinguished *obtusa* from *angularis* by the angles of the prothorax not being promi-



ment, and from *guttulata* by the elytra being convex and not impressed. In his description of *debilis*, he states that *debilis* most closely resembles *obtusa*, but the claws are distinctly cleft with the inner portion acute and shorter than the outer one.

In the LeConte collection are the three specimens mentioned by LeConte under *obtusa*, two bearing the round green label indicating the locality Kansas and the third with the label "Andover." All three are females with simple claws, and all are pale yellow-brown without elytral markings. The specimen with the label *obtusa*, which also bears the Museum of Comparative Zoology type No. 4383, and the one from Andover are alike, but the third specimen, although closely resembling these, represents an entirely different species, with shallower, denser elytral punctation and with a prothorax quite differently shaped. LeConte's description of *obtusa* without doubt is based on this as well as the other two specimens. He described the prothorax as being widely impressed on the sides, and this applies to this specimen rather than the other two. The first Kansas specimen bearing the label *obtusa* and the one with the label *Andover* are females of LeConte's species *debilis*. Since LeConte himself gives as the chief distinction between *debilis* and *obtusa* the fact that *obtusa* has simple claws, in reality a mere sex difference, it seems best to regard these two specimens (females of *debilis*) as LeConte's *obtusa*, which Horn has already synonymized with *debilis*, and to describe as a new species the second of LeConte's Kansas specimens. This is treated later in this paper as *M. inornata*.

In his descriptions LeConte emphasizes the fact that *obtusa* and *debilis* have convex elytra without depressions and also that the elytra are covered with a dense, silvery, pale pubescence, and unlike any of his descriptions of the other species of *Monoxia* he describes the elytra as being deeply ("profunde") punctate, the punctures being stronger anteriorly. These are the most striking characteristics of the species. *M. debilis* may be distinguished (1) by its size, which approximates that of *guttulata* and *angularis*; (2) by the shape of its prothorax, which is unusually long, and with the width considerably less than twice the length; not greatly depressed, the basal angles not at all prominent, and with a small, acute tooth; (3) the moderately dense silvery pubescence, not so long and not so fine as in some species; (4) the elytral punctation, which is unusually deep, well spaced and not at all confluent anteriorly; in *guttulata* and *conspuata* the punctures are much denser; (5) the convex elytra, without depressions.

As Horn states, the locality Andover, Mass., is evidently a mistake. Specimens have been examined from the following localities: Alberta (Medicine Hat, Edmonton); Idaho; Montana (Whitehead); North Dakota (Mott); Kansas; Colorado (Colorado Springs, near Durango, La Plata County; Garland, Manitou, Pingree Park, Ridgway, Rocky

Mountain National Park); Arizona (Flagstaff, Cloudcroft); New Mexico (Magdalena Mountains).

MONOXIA INORNATA, new species

PLATE 18, FIGURE 9

Large (about 4.5 mm.), broadly oblong-oval, pale yellow-brown, frequently without elytral markings or with only pale reddish-brown traces of subsutural vitta and darkened humeri, under surface usually more or less dark; prothorax not twice as broad as long, with posterior angles not pronounced and sides not greatly narrowed anteriorly; elytra without depressions, densely punctate and pubescent. Head with pale lower front, gradually deepening in color over occiput; mouth parts frequently pale or only in part brown, median line dark; the dense occipital punctation partially concealed by pubescence. Antennae pale with outer joints darker. Prothorax more rectangular in shape than in *debilis*, but not twice as broad as long, and with the sides not very arcuate and not much narrowed anteriorly; disk more depressed in middle and on sides than in *debilis*, the basal angles tending to be less obtuse than in *debilis*, and with blunter basal tooth; punctation dense and shallow, somewhat obscured by pubescence; usually without markings, sometimes with an M-shaped darkening. Elytra with intrahumeral sulcus not marked; punctation dense, tending to be confluent, shallow and coarse, and not entirely concealed by the long but not dense pubescence; color frequently entirely pale or with pale reddish-brown traces of subsutural vitta and darkened humeral spot, occasionally the latter extending down the sides. Undersurface more or less darkened, usually metasternum and first abdominal segments dark, but occasionally whole undersurface except last abdominal segment dark. Legs pale. Length, 3.5 to 4.6 mm.; width, 1.5 to 2 mm.

*Type*, male, and 6 paratypes (3 males, 3 females), U. S. N. M. No. 44019, collected by F. H. Snow; 60 paratypes in collection of University of Kansas.

*Type locality*.—Gove County, Kansas.

*Distribution*.—Kansas (western Kansas, Gove County); Texas; Nebraska (Lincoln); North Dakota (Williston); Montana (Glendive); Alberta (Medicine Hat); Wyoming (Sheridan); Colorado (Fort Collins, Salida, Joliet, Paonia, Denver); New Mexico.

*Food plants*.—Gumweed, *Grindelia* sp. (H. H. Brisley, F. S. Carr), *Grindelia squarrosa* (Colorado Agricultural College).

*Remarks*.—*M. inornata* has been collected repeatedly on species of *Grindelia*. It is one of the larger species of *Monoxia* and is usually pale yellow-brown with few elytral markings. It differs from *M. angularis* in lacking the prominent basal angles of the prothorax

and in having shallower elytral punctation, and it differs from *guttulata* in not having so long or so erect pubescence and not having a marked depression on the elytra. The aedeagus, too, is more acutely tipped. It resembles most closely *M. debilis* but is distinguished from it (1) by the shape of the prothorax, which is more rectangular and depressed, and not so long as that of *debilis*, with only slightly arcuate sides and with blunter basal tooth; (2) by having shallower, denser elytral punctation; (3) by having longer pubescence, particularly noticeable on the prothorax. The aedeagus is not so heavy as that of *debilis* and is more acutely pointed. As stated in the discussion of *debilis*, LeConte confused this species with *obtusa* (= *debilis*).

Both Cooley<sup>10</sup> and Essig<sup>11</sup> refer to a species of *Monoxia* injurious to cottonwood, but in all the collections examined, only a single series, collected by A. N. Caudell at Denver, Colo., which closely resembles this species and which consists of a larva, a pupa, and three shriveled, immature adults, is labeled as being found on cottonwood. I have been unable to learn of any other collector who has observed a *Monoxia* on cottonwood.

MONOXIA GRISEA, new species

PLATE 19, FIGURE 15

Large (about 4.5 mm.), broadly oblong, with dense gray pubescence; elytra not depressed, coarsely but shallowly punctate; aedeagus longer than that of *M. debilis*. Head covered with long, appressed, pale pubescence hiding the punctation; lower front usually paler yellow than occiput, labrum and median line dark, occasionally in dark specimens head entirely dark. Prothorax not twice as broad as long, with arcuate sides and well-developed but not conspicuous basal tooth, disk depressed in middle and on sides; the coarse dense punctation obscured by dense, closely appressed pubescence. Elytra broadly oblong, coarsely but rather shallowly punctate, covered with dense gray pubescence; often entirely pale and appearing grayish from the pubescence; in dark specimens elytra heavily mottled. Body beneath densely pubescent; in pale specimens sometimes entirely pale, in dark specimens dark except the last abdominal segments. Legs pale or speckled. Length, 4.2 to 5 mm.; width, 2 to 2.2 mm.

*Type*, male, and 4 paratypes (3 males, 1 female), U. S. N. M. No. 44020, collected in June 1904, collector unknown.

*Type locality*.—Bozeman, Mont.

*Distribution*.—Montana (Bozeman, Glendive, Gallatin County, Musselshell, Shields River, Yellowstone River Valley); Idaho (Beaver Canyon); Alberta (Medicine Hat, Edmonton).

<sup>10</sup> Montana Agr. Coll. Exp. Stat. Bull. 112, p. 60, 1918.

<sup>11</sup> Insects of western North America, p. 473, 1926.

*Food plants.*—Collected on *Artemisia* sp. (sagebrush) by Kenneth M. King at Musselshell, Mont., and on both *Artemisia* sp. and *Solidago* (goldenrod) by F. S. Carr at Medicine Hat, Alberta.

*Remarks.*—Like *M. guttulata*, *M. grisea* has been collected on sagebrush. Unlike *M. guttulata*, it has no conspicuous elytral depressions and also has a longer and differently shaped aedeagus. It is closely related to *M. debilis*, but is usually larger, and may be distinguished by its even denser pubescence and coarser but shallower punctation. The prothorax is a little wider and frequently more depressed than in *M. debilis*, and the aedeagus is considerably longer and more acutely pointed. The species, apparently, is confined to Idaho, Montana, and Alberta.

MONOXIA ELEGANS, new species

PLATE 18, FIGURE 1

Medium sized (about 4 mm.), oblong, moderately convex, with a broad head and narrow and not greatly depressed prothorax; sometimes entirely pale, again with the prothorax and elytra darkly marked and under surface more or less darkened; densely covered with short, fine pubescence, and rather finely and shallowly punctate. Head unusually wide, densely pubescent; in pale specimens entirely pale, in dark ones, speckled; the median line, labrum, and tubercles above antennal base dark. Antennae slender, usually reddish yellow, in dark specimens with the outer edges darkened. Prothorax not twice as broad as long and not much wider than the head, with arcuate, sometimes angulate sides, and small tooth at basal angle; not much depressed in the median line and the sides usually without depressions and more smoothly rounded than in most species of *Monoxia*; densely covered with closely appressed pubescence covering punctation; in pale specimens pronotum entirely pale, in dark specimens sometimes entire disk except margin mottled. Elytra oblong, moderately convex; without depressions; humeri well developed with a short, intrahumeral sulcus; punctation shallow, dense, and rather fine, somewhat obscured by the short pubescence; color variable, usually entirely pale, but sometimes heavily mottled. Body beneath covered with fine pubescence; sometimes pale, occasionally under surface and legs speckled. Length, 3.4 to 4.5 mm.; width, 1.5 to 2.2 mm.

*Type*, male, and 5 paratypes (4 males, 1 female), U. S. N. M. No. 44021, collected by H. F. Wickham, July 11, 1912. Paratypes also in collection of Museum of Comparative Zoology, Cambridge, Mass., and California Academy of Sciences, San Francisco, Calif.

*Type locality.*—Deming, N. Mex.

*Distribution.*—New Mexico (Albuquerque, Deming, Mesilla Park, Las Cruces, State College, Tula Rosa); Arizona (Chiricahua Moun-

tains, Glendale, Hot Springs, Sacaton, Winslow); Utah (Salt Lake); Nevada (Esmeralda County, Pyramid Lake); Colorado, Montana, Idaho (Bruneau, Parma, Succor); Oregon (Adrian).

*Food plants.*—Kafircorn (*Sorghum vulgare* var. *caffrorum*); *Atriplex canescens* (C. N. Ainslie); *Chenopodium* sp.; sugar beet (*Beta vulgaris*).

*Remarks.*—This species, approaching in size *M. angularis*, *guttulata*, *debilis*, *inornata*, and *grisea*, the largest species of the genus, is at once differentiated from them by its finer and shallower punctation and its slenderer antennae. In its convexity and comparative lack of pronotal and elytral depressions it is similar to *debilis*. The head in this species appears unusually broad in relation to the prothorax, which is not much wider, in contrast to such species as *M. angularis*, in which the prothorax is much wider than the head. The aedeagus is unlike that of any other species of the genus, being short, broad, and with a broad, rounded tip.

A series of specimens from Salt Lake, Utah, is considerably smaller and darker but otherwise not distinguishable from the usually large and entirely pale Arizona and New Mexico specimens. There is a series from Sprekels, Calif., that has much denser elytral pubescence, which entirely conceals the punctation below. In these the aedeagus, while of similar shape, is even broader. It is not clear whether these California specimens represent a geographic race or subspecies of *elegans* or possibly a distinct species. Specimens from Adrian, Oreg. (on the border between Idaho and Oregon), Idaho, and Montana do not differ from the Arizona and New Mexico ones.

MONOXIA PUBERULA, new species

PLATE 19, FIGURE 14

Medium sized (about 3.5 mm.), slender, not depressed, with a narrow prothorax, pale yellow-brown with few pale reddish-brown markings, and with rather finely punctate and somewhat shining elytra covered with short, inconspicuous pubescence. Head with pale lower front, the color gradually deepening over the occiput; labrum and median vertical line darker. Punctation shallow and obscured by pubescence. Antennae with paler basal joints. Prothorax distinctly less than twice as broad as long, with arcuate, sometimes angulate, sides and a small tooth at the basal angle; disk not greatly depressed, often with only a slight median channel and not marked lateral depressions; densely but shallowly punctate with short, inconspicuous pubescence; sometimes entirely pale, sometimes with reddish-brown Y-shaped median mark and two lateral spots. Elytra elongate, not depressed, with a short intrahumeral sulcus, densely and shallowly punctate, and with short, fine, not at all conspicuous pubescence; surface somewhat shining, sometimes entirely pale, or

with faint reddish-brown humeral spot and traces of subsutural vitta and lateral spots, seldom with heavy black markings. Body beneath and legs pale, metasternum occasionally a little darkened; finely pubescent. Length, 3.5 to 4 mm.; width, 1.5 to 1.8 mm.

*Type*, male, and 44 paratypes, U. S. N. M. No. 44024, collected by D. K. Duncan, July 1931. Paratypes also in collections of Museum of Comparative Zoology, Illinois State Natural History Survey, Kansas University, California Academy of Sciences, Colorado Agricultural College, F. S. Carr, D. K. Duncan, C. A. Frost, H. R. Brisley, M. H. Hatch, and Ralph Hopping.

*Type locality*.—Wheatfields, near Globe, Ariz.

*Distribution*.—Texas (Marathon, Marfa); Arizona (Bowie, Bright Angel, Chiricahua Mountains, Globe, Skull Valley); New Mexico (Alamogordo, Sacramento Mountains); California (Mountain Spring); Colorado (Boulder, La Junta, White Rocks, Boulder County); Utah (Salt Lake); Alberta (Medicine Hat).

*Food plants*.—*Gutierrezia sarothrae* (H. R. Brisley), *Gutierrezia* sp. (F. S. Carr); *Lepidium alyssoides* (J. D. Mitchell and R. A. Cushman, at Marfa, Tex.).

*Remarks*.—This slender, pale, medium-sized species, evidently abundant in western Texas, Arizona, and New Mexico and extending north to Alberta, is distinctive in being one of the least pubescent of the genus. F. S. Carr wrote that when alive the beetles are a "beautiful translucent light yellow." The elytral punctation, although dense, is shallow and fine, and the pubescence is very short and inconspicuous, so that the elytra appear smoother and more shining than in the other species. Of about the same size as *M. consputa*, it is not so distinctly punctate a species and is slenderer, with a narrower prothorax, and is not depressed. A specimen of *puberula* is in the LeConte collection in the series under *debilis*. It has been reported from both Arizona and Alberta as feeding on species of *Gutierrezia*.

MONOXIA SCHIZONYCHA, new species

PLATE 19, FIGURE 16

Medium sized (about 4 mm.), slender, pale yellow-brown, usually with darker reddish-brown humeral spot and traces of subsutural vitta, occasionally heavily marked with spots and lateral infuscation; elytra rather coarsely and deeply punctate and with short, fine pubescence; claws in both sexes toothed. Head with paler lower front, gradually deepening in color to darker yellow on occiput; labrum and median line dark; punctation dense, pubescence dense and appressed. Antennae paler at base. Prothorax scarcely twice as broad as long, with rounded sides and small basal tooth; punctation

dense, shallow, and obscured by the short, dense pubescence; disk depressed in middle and at sides; usually entirely pale but sometimes with a reddish-brown M-shaped marking. Elytra with a long intrahumeral sulcus extending well down the elytra; punctation moderately coarse, dense, and deep, and not obscured by the short, pale and not very dense pubescence; elytra sometimes entirely pale or with traces of the typical interrupted subsutural vittae, often with other scattered pale brown spots, and occasionally heavily marked. Body beneath and legs usually pale, densely pubescent. Claws in both sexes toothed. Length, 3.6 to 4 mm.; width, 1.6 to 1.8 mm.

*Type*, female, and 4 paratypes (2 males and 2 females), U. S. N. M. No. 44023, collected by R. C. Shannon.

*Type locality*.—Ritzville, Wash.

*Distribution*.—Washington (Ritzville); Oregon (La Grande, Echo, Crater Lake Park, Silver Lake, Klamath County); California (Facht, Lassen County); Idaho (Stanley, Atlanta); Colorado (Logan County).

*Food plants*.—Sugar beet (E. S. G. Titus); *Chrysothamnus* (E. A. Scullen).

*Remarks*.—Although this species is unquestionably closely related to others of the genus, it differs from most of them by having the claws of both sexes toothed. The only other species of the genus having this peculiarity are three belonging to the *sordida* group. *M. schizonycha* is not related to this group but closely resembles *consputa*. It is a little slenderer and the punctation is a little deeper and coarser than in *consputa*, and the elytral depressions not so pronounced. The punctation is not so shallow and nearly obsolete as in *puberula* but distinct, and the elytral pubescence is a little longer.

MONOXIA OBESULA, new species

PLATE 19, FIGURE 12

Small (about 3 mm.), robust, covered with dense pubescence, the prothorax and elytra not depressed, pale yellow with few elytral markings, metasternum usually dark; elytra distinctly punctate. Head pale, deeper in coloring on the occiput, labrum and median line dark; pubescence dense, hiding punctation. Antennae with slightly darker outer joints. Prothorax considerably less than twice as broad as long, the sides arcuate and with a distinct basal tooth; disk little depressed in middle or on sides; usually entirely pale and covered with dense pubescence hiding the punctation. Elytra broadly oblong, convex, with slight intrahumeral sulcus; punctation dense, shallow and partially concealed by the fine pale pubescence; elytra sometimes entirely pale, usually with small spots forming traces of a subsutural vitta, and often other spots scattered on the sides. Body beneath densely pubescent; mesosternum and metasternum dark, sometimes

the first two or three abdominal segments also dark; legs pale. Length, 3 to 3.4 mm.; width, 1.4 to 1.8 mm.

*Type*, male, and 6 paratypes (4 males, 2 females), U. S. N. M. No. 44025, collected by D. K. McMillan, May 12, 1909.

*Type locality*.—Kingsville, Tex.

*Distribution*.—Texas (Corpus Christi, Brownsville, Beeville, Kingsville).

*Food plant*.—*Chenopodium* sp. (McMillan).

*Remarks*.—This small, convex, broadly oblong, and densely pubescent species is not easily confused with the other small species, which are all slenderer and usually more depressed. It is similar to the following species, *M. pallida*, and may possibly be an eastern variety, although the punctation is finer and the aedeagus considerably longer.

MONOXIA PALLIDA, new species

PLATE 19, FIGURE 11

Medium sized (about 3.5 mm.), robust, prothorax and elytra little depressed, covered with rather long, pale pubescence, elytra densely and rather coarsely punctate; pale yellow, usually with few elytral spots, metasternum dark. Head pale with a dark median streak and dark labrum; the pale pubescence covering punctation on occiput. Antennae pale. Prothorax not twice as wide as long, with arcuate sides and small basal tooth, little depressed; the coarse, dense punctation nearly concealed by the closely appressed pubescence; usually entirely pale, but sometimes with pale reddish-brown irregular markings. Elytra broadly oblong, convex, with a short intrahumeral sulcus, rather coarsely and densely punctate and covered with dense, pale, sometimes erectish pubescence; usually with few small markings. Body beneath finely pubescent, pale, with the metasternum and sometimes the first abdominal segments dark. Legs pale. Length, 3.2 to 3.8 mm.; width, 1.5 to 1.8 mm.

*Type*, male, and 52 paratypes, U. S. N. M. No. 44026, collection of H. Soltau.

*Type locality*.—Florence, Colo.

*Distribution*.—Colorado (Denver, Florence, Fort Collins, Grand Junction, Hotchkiss, La Veta, Rocky Ford); Idaho (Blackfoot, Parma).

*Food plants*.—Sugar beet (E. G. S. Titus, H. O. Marsh); *Chenopodium* sp. (H. Lanchester).

*Remarks*.—*M. pallida* so closely resembles *M. obesula* that I have hesitated in describing it as specifically distinct. In general, the specimens are a little larger, the elytral punctation coarser, and the pubescence not so fine. The aedeagus, while similar, is much shorter. *M. obesula* is known only from along the coast of southeastern Texas, and *pallida* has been collected only in Colorado and Idaho. Possibly specimens from intermediate stations may reveal a gradation between



these two very similar although geographically widely separated colonies. The food plant of both is *Chenopodium*.

*MONOXIA MINUTA*, new species

PLATE 19, FIGURE 10

Small (2.3 to 3 mm.), slender, oblong, prothorax barely twice as broad as long, the sides angulate, disk impressed in the middle and on the sides; elytra finely but distinctly punctate; pubescence moderately dense; color varying from pale yellow with no markings to thickly speckled with black, but even in the pale specimens the under surface more or less darkened. Head variable in color, sometimes entirely pale, sometimes thickly speckled; punctation on occiput nearly concealed by fine pubescence. Antennae pale in pale specimens, with darkened edges in dark ones. Prothorax scarcely twice as broad as long, with sides angulate and with distinct basal tooth; disk impressed in the middle and on the sides; punctation hidden by dense pale pubescence; usually entirely pale, sometimes with faint markings. Elytra narrowly oblong, somewhat depressed, with a long, shallow intrahumeral sulcus; punctation dense, fine but distinct; pubescence moderately dense; color varying from entirely pale yellow to thickly speckled with black. Body beneath covered with fine pubescence; metasternum, at least, and often entire under surface dark; legs pale or speckled. Length, 2.3 to 3 mm.; width, 1.2 to 1.4 mm.

*Type*, male, and 4 paratypes (3 males, 1 female), U. S. N. M. No. 44027, collected by H. K. Morrison. Three paratypes in Museum of Comparative Zoology, Bowditch collection, Cambridge.

*Type locality*.—Arizona ("No. Sonora, Mexico").

*Remarks*.—This is one of the smaller species of *Monoxia* and is distinguished by its slender, oblong shape, its angulate prothorax, distinctly punctate elytra, and long curved aedeagus that has a broad flattened tip, the dorsal opening on which is situated at some distance from the tip. It differs from the *sordida* group in having a narrower prothorax and in being more distinctly and yet not coarsely punctate. Like *M. obesula*, its aedeagus is long and flattened at the tip, but the tip is broader. It is a narrower species than *obesula*, and the sides of the prothorax are more angulate and the disk more depressed.

There are several forms very closely related to this species. Possibly *M. minuta* is a representative of another *M.* group like that to which *conspua*, *angularis*, and *sordida* belong, which may be still actively evolving. A series of specimens from Salt Lake, Utah, and one from Challis, Idaho, are unusually small, a little more coarsely punctate, and although the aedeagus is similar the dorsal opening is situated nearer the tip. Still other series from Flagstaff, Williams, Bright Angel, and Ashfork, Ariz., are slightly larger and more coarsely

punctate, but in their case the opening on the aedeagus appears to be situated still farther from the tip. A small series from Los Angeles, Calif., appears to be a little more coarsely punctate than the typical ones, and the aedeagus is a little wider.

MONOXIA APICALIS, new species

PLATE 18, FIGURE 5

Small (about 3 mm.), in shape and markings similar to darkly marked specimens of *M. sordida*, but less densely pubescent, with the punctation distinctly visible, the elytra even somewhat shining; claws of both sexes toothed. Head densely punctate and lightly pubescent, with the median line impressed and a slight callosity on either side of the vertex near eye; a dark occipital spot sometimes extending down front to below eyes; front usually pale and labrum dark. Antennae pale, often with darker outer joints. Prothorax fully twice as wide as long, with the sides slightly rounded and with a small tooth at the basal angle; disk widely depressed at sides and in the middle; the pubescence partly concealing the rather dense punctation; usually pale with dark median and lateral spots, these often coalescing. Elytra somewhat depressed, with an intrahumeral depression that extends downward and inward about one-third the length of the elytra; densely and distinctly punctate, the pubescence moderately long but not at all obscuring the punctation; heavy dark markings usually predominating over the pale, the pattern similar to darkly marked specimens of *M. sordida*, with the apex pale. Body beneath shining, sparsely pubescent, more or less darkened; legs usually pale, with a dark ring about middle of femora and tibiae; claws of both sexes toothed. Length, 3 to 3.5 mm.; width, 1.4 to 1.7 mm.

*Type*, male, and 3 paratypes, U. S. N. M. No. 44029, collected by H. K. Morrison; 8 paratypes in collection of the Museum of Comparative Zoology, Bowditch collection, Cambridge.

*Type locality*.—Arizona ("No. Sonora, Mexico").

*Distribution*.—Arizona (Higley, Galiuro Mountain), California (Palm Springs).

*Remarks*.—Jacoby<sup>12</sup> figured this species in the *Biologia Centrali-Americana* as *M. guttulata* LeConte. It is a much smaller species than *guttulata* and belongs to a different group, being closely related to *M. sordida*. It has a similarly shaped short, wide prothorax, and the claws are toothed in both sexes, as in *sordida*. The abdomen of the male, however, is more distinctly truncate than in most specimens of *sordida*. It is also distinguished from *sordida* by having less pubescent elytra, which are somewhat shining and the punctation of which is coarser and distinctly visible. The prothorax also appears

<sup>12</sup> *Biologia Centrali-Americana*, vol. 6, pt. 1, p. 497, pl. 27, fig. 25, 1887.

a little shorter. Unlike most species of *Monoxia*, *apicalis* is uniformly darkly marked in all the specimens examined, the apex of the elytra being always pale. The elytral pattern resembles that of heavily marked specimens of *sordida*. The aedeagus has a slenderer and more finely pointed tip than that of *sordida*.

**MONOXIA BRISLEYI, new species**

**PLATE 18, FIGURE 4.**

Small (about 3 mm.), similar in shape to *M. sordida*, with a short, broad prothorax and with the claws toothed in both sexes, but differing from *sordida* in being more lightly pubescent; all the specimens examined much paler than *apicalis*; the aedeagus longer and slenderer than in either *sordida* or *apicalis*. Head with a small callosity on either side of vertex near the eye, the median line impressed; pubescence dense and covering punctation on occiput; color pale, deepening on occiput, labrum sometimes darker brown. Antennae pale with outer joints a little darker. Prothorax approximately twice as wide as long, with slightly angulate sides and small basal tooth; disk depressed on sides and in middle; densely and shallowly punctate, the punctation not entirely concealed by the fine pubescence; color pale, sometimes with a darker median area. Elytra with well-marked humeri and long incurving intrahumeral depression; finely and densely punctate and finely pubescent; color either entirely pale or with small brown spots, more or less serially arranged. Body beneath either entirely pale or with the metasternum and first abdominal segments darker, finely pubescent; legs pale with a dark ring about the middle of the femora and tibiae. Claws in both sexes toothed. Length 2.8 to 3.4 mm.; width 1.3 to 1.5 mm.

*Type* and 6 paratypes, U. S. N. M. No. 44030, collected by H. F. Wickham, August 10; 3 paratypes in the Museum of Comparative Zoology, Bowditch collection, Cambridge.

*Type locality*.—Lancaster, Calif.

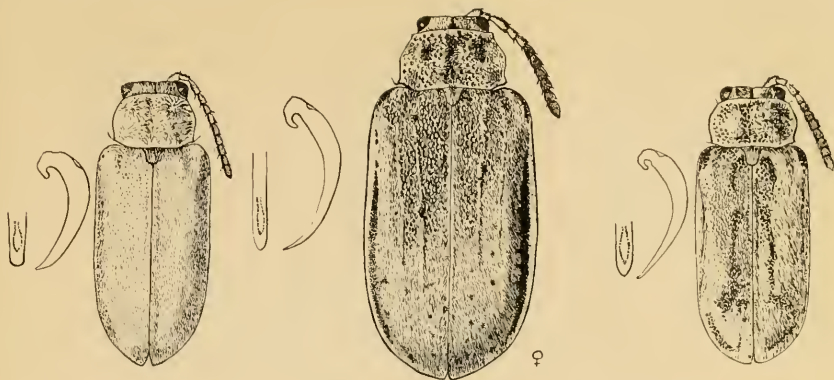
*Distribution*.—Arizona, Utah, California (Inyo Mountains, Lancaster, Palmdale).

*Food plant*.—Reared from *Chenopodium album* (H. R. Brisley).

*Remarks*.—This tiny species, closely related to *sordida* and *apicalis*, differs from both by having a longer and slenderer aedeagus. It is not so densely pubescent as *sordida* and is paler than *apicalis*, often being without any dark elytral markings. The punctation of the elytra is finer and less conspicuous than in *apicalis*, and the elytra are not at all shining as they are in *apicalis*. The abdomen of the male is not so deflexed as in the majority of the species. *M. brisleyi* is named after H. R. Brisley, who reared it from *Chenopodium album* and set it aside as a new species. A. T. McClay has collected it in numbers in the Mojave Desert on a wild desert plant.

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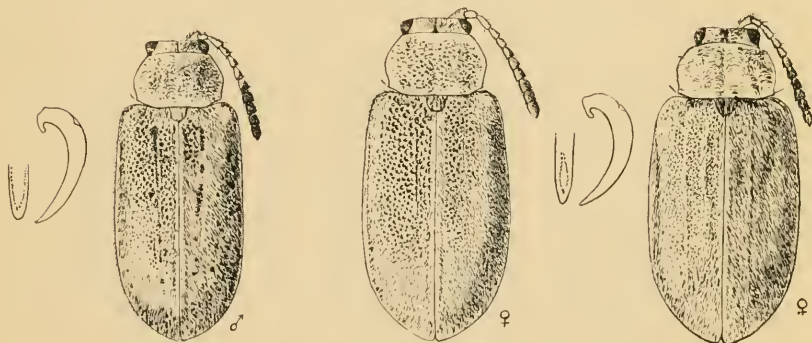
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1 *M. elegans* 2 *M. angularis* type 3. *M. batisii*



4. *M. brisleyi* 5. *M. apicalis* 6. *M. sordida* type



7. *M. debilis* ♂ type 8. *M. debilis* ♀ (obtusa type) 9. *M. inornata*

SPECIES OF MONOXIA.

1, *M. elegans*, new species, Deming, N. Mex.; 2, *M. angularis* (LeConte), type, genitalia from Oregon specimen; 3, *M. batisii* Blatchley, Dunedin, Fla.; 4, *M. brisleyi*, new species, Lancaster, Calif.; 5, *M. apicalis*: new species, Arizona; 6, *M. sordida* (LeConte), type, genitalia from Tempe, Ariz., specimen; 7, *M. debilis* (LeConte) type, genitalia from Flagstaff, Ariz., specimen; 8, *M. debilis* (type of *obtusa*, LeConte); 9, *M. inornata*, new species, second specimen under *obtusa* in LeConte collection, genitalia from Gove County, Kan., specimen.



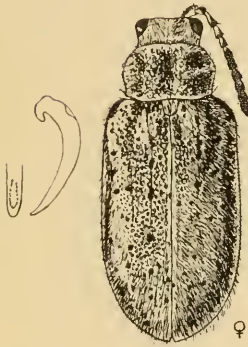
10 *M. minuta*



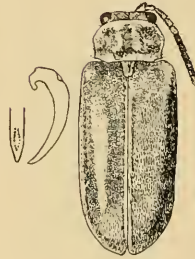
11. *M. pallida*



12. *M. obesula*



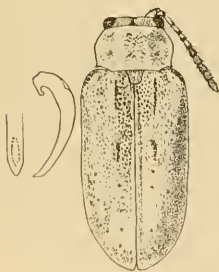
13. *M. guttulata* type



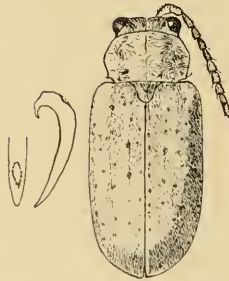
14. *M. puberula*



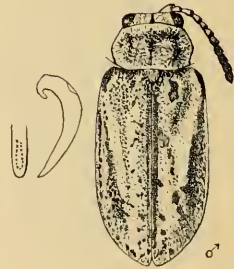
15. *M. grisea*



16 *M. schizonycha*



17. *M. beebei*



18 *M. consputa* type

SPECIES OF MONOXIA.

10, *M. minuta*, new species, Arizona; 11, *M. pallida*, new species, Florence, Colo.; 12, *M. obesula*, new species, Corpus Christi, Tex.; 13, *M. guttulata* (LeConte,) type, genitalia from Ross, Calif., specimen; 14, *M. puberula*, new species, Globe, Ariz.; 15, *M. grisea*, new species, Bozeman, Mont.; 16, *M. schizonycha*, new species, La Grande, Oreg.; 17, *M. beebei* Blake, type, Santa Inez Island, Baja California; 18, *M. consputa* (LeConte), type, genitalia from Mount Tamalpais, Calif., specimen.