

A REVISION OF THE GENUS
DIPLOTAXIS (COLEOPTERA,
SCARABAEIDAE,
MELOLONTHINAE)

PART 1

PATRICIA VAURIE

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 115: ARTICLE 5 NEW YORK: 1958

A REVISION OF THE GENUS *DILOTAXIS*

A REVISION OF THE GENUS *DIPLOTAXIS*
(COLEOPTERA, SCARABAEIDAE,
MELOLONTHINAE)



PART 1

PATRICIA VAURIE

*Research Associate
Department of Insects and Spiders*

BULLETIN
OF THE

AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME 115 : ARTICLE 5

NEW YORK : 1958

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 115, article 5, pages 263–396,
figures 1–158, tables 1–5

Issued October 15, 1958

Price: \$2.25 a copy

CONTENTS

INTRODUCTION	269
Acknowledgments	269
History and Distribution	270
Habitat.	271
<i>Diplotaxis</i> and Related Genera	271
General Morphology and Phylogeny	274
Sexual Dimorphism	278
Importance of the Male Genitalia	279
Collectors of Recent Material	280
Species Removed from the Genus	280
Treatment.	280
SYSTEMATIC TREATMENT	282
Genus <i>Diplotaxis</i> Kirby	282
Species Group <i>aenea</i>	286
Species Group <i>pilifera</i>	291
Species Group <i>puberea</i>	294
Species Group <i>ohausi</i>	311
Species Group <i>moerens</i>	313
Species Group <i>brevidens</i>	324
Species Group <i>cribulosa</i>	328
Species Group <i>rugosifrons</i>	333
Species Group <i>guatemalica</i>	334
Species Groups <i>puberula</i> and <i>pilipennis</i>	336
Species Group <i>puberula</i>	337
Species Group <i>pilipennis</i>	349
Species Group <i>arizonica</i>	356
Species Group <i>aurata</i>	358
Species Group <i>simplex</i>	358
Species Group <i>hebes</i>	369
Species Group <i>mus</i>	376
Species Group <i>rudis</i>	377
Species Group <i>rockefelleri</i>	380
Species Group <i>sordida</i>	382
Incertae Sedis	387
APPENDIX: SPECIMENS EXAMINED	390
BIBLIOGRAPHY	394
INDEX OF SCIENTIFIC NAMES	396

INTRODUCTION

THE GENUS *Diplotaxis* is composed of a large number of species (about 180) of North and Central American scarabaeid beetles of the subfamily Melolonthinae, or, as it is considered by many recent authors, the family Melolonthidae. They are small or medium-sized (6 to 12 or 14 mm.), black or tawny "June bugs," or "May beetles" or cockchafers, which are very similar morphologically. Sexual dimorphism is generally not striking as in some Scarabaeidae in which the males exhibit elaborate secondary sexual characters of horns or tubercles, or as in the long-horn beetles (Cerambycidae). Individual variation is slight, not as in some beetles such as the weevils (Curculionidae) in which individual variation may be so great that isolated specimens are often misidentified as to species. In *Diplotaxis*, the external characters may be so very similar that often the male genitalia provide the only criterion for species differentiation. This tendency to homogeneity extends even to the genera, as it is well known that the melolonthids are not well differentiated structurally.

The species of *Diplotaxis* are nocturnal and are not considered to be of economic importance. They are plant feeders, but usually damage only vegetation not utilized extensively by man, such as mesquite, catclaw, creosote bush, juniper, and various weeds.

The genus occurs in the New World only, from Panama north to Canada, and is most abundantly represented on the plateau from Mexico City north to Arizona and the southwestern United States.

The present study began as a faunal review of the large series of *Diplotaxis* collected by the David Rockefeller expedition to northern Mexico in 1947, but progress was not possible without a revision of the genus. Critical material from central and southern Mexico was obtained on a collecting trip to these regions made possible in 1955 with the support of a grant from the Penrose Fund of the American Philosophical Society. Two subsequent grants from the National Science Foundation have enabled me to continue the revision of the genus and to study the types in this country and in Europe, and I am

grateful to these institutions for their aid. Altogether, nearly 20,000 specimens have been examined by me.

It is most convenient to publish the revision in two parts because of the large number of species involved. Part 1 includes almost all of the 46 species clothed with dorsal hairs. Thirty-three of these occur south of the United States, in Mexico, Central America, and the West Indies. The species omitted are five (*brevisetosa*, *dahli*, *hispida*, *muricata*, and *sparsesetosa*), which, although hairy, appear to belong to groups of species which are found predominantly in the United States and show no close affinities to the species studied in part 1. Nevertheless, these five are included in the keys. Included also in part 1 are 25 of the approximately 140 glabrous or non-hairy species that seem to belong with or near the hairy groups. Fifteen new species and one subspecies are described; seven names have been placed in synonymy; and two species have been removed from the genus.

ACKNOWLEDGMENTS

In addition to the grants received from the National Science Foundation and the American Philosophical Society, mentioned above, I am in debt to many institutions and individuals for other help. Gifts of significant material are hereby acknowledged with thanks from Dr. Milton W. Sanderson for specimens from Yucatan, and from Drs. Richard B. and Robert K. Selander for material from other parts of Mexico, notably Michoacan, an area apparently rich in species. Dr. Kurt Delkeskamp of the Zoologisches Museum in Berlin kindly made available the types of Moser in his care and has also given to the American Museum of Natural History some species lacking in the collection. Dr. E. B. Britton and Miss Christine von Hayek of the British Museum spent time comparing and making notes on types of a few species for me. Dr. E. J. Alexander of the New York Botanical Gardens made identifications of some Mexican plants on which the *Diplotaxis* had been found. Dr. J. O. Husing of the Martin-Luther-Universität at Halle made available the types

of Burmeister. Dr. Mont A. Cazier of the American Museum of Natural History, who initiated this study, has helped with advice and suggestions.

I am also indebted to the following persons and the institutions with which they are connected for the loan of specimens: Dr. E. B. Britton and Miss C. von Hayek, British Museum (Natural History); Mr. H. B. Leech, California Academy of Sciences; Mr. H. Dietrich, Cornell University; Drs. H. Sachtleben and J. W. Machatschke, Deutsches Entomologisches Institut; Drs. Walter B. Jones and J. M. Valentine, Geological Survey of Alabama; Drs. M. W. Sanderson and R. B. Selander, Illinois Natural History Survey; Drs. Leonilla Vazquez and Federico Islas, Instituto de Biología, Mexico City; Drs. G. Colas and A. Descarpentries, Muséum d'Histoire Naturelle, Paris; Dr. P. Richter, Oregon State University; Dr. W. W. Gibson, Rockefeller Foundation Agricultural Program in Mexico; Dr. Elli Franz, Senckenberg Museum, Frankfurt; Dr. F. Werner, University of Arizona; Drs. P. D. Hurd, Jr., and M. S. Wasbauer, University of California at Berkeley; Mr. A. T. McClay, University of California at Davis; Drs. T. H. Hubbell and E. J. Kormondy, also Mr. T. J. Cohn, University of Michigan; Dr. O. L. Cartwright, United States National Museum; Drs. S. L. Tuxen and G. Larsson, Universitets Zoologiske Museum, Copenhagen; Dr. K. Delkeskamp, Zoologisches Museum, Berlin; and Dr. H. Freude, Zoologische Staatssammlung, Munich. The following individuals also contributed specimens for study: Messrs. R. R. Dreisbach, C. A. Frost, K. Hagen, R. K. Selander, and B. Rotger.

The maps were drawn with the help of my husband, Dr. Charles Vaurie, who helped also with many of the drawings.

HISTORY AND DISTRIBUTION

The genus *Diplotaxis* was erected by Kirby in 1837,¹ with *tristis* as the only species. Three species described previously (*liberta*, *sordida*, *frondicola*) by Germar in 1824 and Say in 1825 were transferred from *Melolontha* to

Diplotaxis by Blanchard in his catalogue of 1850, in which he also added 10 new species from the United States and southward. Burmeister five years later described five additional species. Lacordaire (1856) summarized the species of the genus but added none. In the half century between 1856 when LeConte wrote his synopsis of the Melolonthidae of the United States and 1909 when Fall revised the group, the number of species described from the United States was increased from 29 to 95. LeConte had described 22 species and Fall almost all the remainder except for a few by Horn (1894), Linell (1896a, 1896b), and Schaeffer (1907). In the meantime Bates (1887-1890) described 24 Mexican and Central American species that were not included by Fall in his revision, and these, with the addition of species described by Cartwright, Casey, Cazier, Fall (1932), Moser, Robinson, Saylor, and Vaurie have about doubled the number of species known so far.

The 66 species included in this paper are chiefly Mexican in distribution. Forty-five of them inhabit Mexico or Central America but are not found in the United States; five additional species included here occur in the United States only, and 15 species are found on both sides of the border. One species is found in Jamaica. In part 2 of this revision about 70 additional species will be discussed from Mexico, many of which are also found in the United States, together with 50 species that are endemic to the United States. Only two species of the genus range as far south as Panama, and only three or four are recorded south of Guatemala. In Guatemala, however, 20 species are known, 13 of which are discussed in the present paper. In Mexico the majority of species inhabit the highlands; only a few are found on the isthmus, on the coasts, and in Baja California. In the United States most of the species are found in the southwest—in Arizona, California, New Mexico, and Texas. A few species extend north to Canada, or to the central states, and 13 to the eastern and Gulf coast region.

Additional information on distribution will appear in part 2 of the revision, and keys will be provided for certain faunal regions, such as Baja California, and Central America from Guatemala southward.

¹ Not 1840 as erroneously quoted by Blanchard and some subsequent authors.

HABITAT

Our knowledge of the life history of these small scarabs is most imperfect. The literature records a few host plants, and we know that most species are attracted to light. Perhaps their life history is generally similar to that of other Melolonthinae, as summarized by Britton (1957, p. 5), who states, in the case of Australian representatives of this group, that "in general, larval life . . . is . . . of many months duration, while active adult life is brief, lasting only a few days or weeks. Eggs are laid in the soil, and the larva feeds on roots and humus. . . . Pupation occurs in a cell in the soil and the adult may lie in this cell . . . until conditions are suitable for emergence. Rainfall sufficient to soften the soil is usually necessary. . . . Adult Melolonthinae are usually most active at or after nightfall. The species which fly at dusk normally spend the day sheltered among leaves."

Most of the damage done to plants by *Diplotaxis* is undoubtedly done by the larvae, although adults feed on leaves to some extent. The vegetation chosen by the adults is normally not of economic importance, as stated above, although I did find *Diplotaxis simplex* feeding at night on the flowers and leaves of gardenia bushes at Lake Catemaco in southeastern Mexico. However, the great majority of the 800 specimens of this and other species collected at this locality were found on weeds or arborescent bushes on scrubby hillsides. From the end of June through August in southern and central Mexico, I found that these beetles could be picked at night from bushes and shrubs and weeds with the aid of headlamps or flashlights; rarely did individuals come to lighted sheets on the ground as they have been known to do in certain canyons and mountains of southern Arizona. On occasion, the same bush could be gone over indefinitely during the course of an evening, with new beetles ever coming to it, but whether they were flying to the bush or coming up from the ground I do not know. Certainly some individuals that were collected in Oaxaca must have come from the soil at least quite recently before their capture because the front of the clypeus was encrusted with earth.

Although the labels of some specimens that I have seen state that specimens of *Diplotaxis* have been collected on flowers, probably during the daytime (though it was not so stated), I have seldom found these beetles during the hours of daylight. One exception is *aenea* Blanchard which I have taken by day.¹ Some of the flowers, bushes, shrubs, trees, or weeds for which I have data in connection with *Diplotaxis* specimens are: *Acacia*, *Asclepias*, *Baccharis*, *Bauhinia*, *Cassia*, *Enterolobium*, *Franseria*, *Hymenoclea*, *Juniperus*, *Larrea*, *Mimosa*, *Prosopis*, *Prunus*, *Rhus*, and *Schinus*; also "pecan," "decaying coconut," "dug up at root of white pine," "dug up at roots of Mesquite." Habitat notes are included under those species for which they are available.

Diplotaxis AND RELATED GENERA

According to LeConte (1856, p. 265), "a character not noted by previous authors, which seems to distinguish this group, is the entire coalescence, without perceptible suture between the 5th ventral segment and the propygidium." He adds, "taken in conjunction with the small pygidium, the disappearance of the sixth ventral segment, the distinctness of the ventral sutures, and the prominence of the anterior coxae," this character renders *Diplotaxis* "as distinctly limited as the other groups here recognized." LeConte's remarks are correct, but, unfortunately, some of these characters are common also to other genera to be discussed below.

In Dalla Torre (1912) and in Blackwelder's catalogue (1944), the genus *Diplotaxis* is placed in the tribe Melolonthini, a cosmopolitan tribe with the majority of its more than one hundred genera restricted to the Old World, and only eight or nine in the New World. One of these Old World genera, *Apo-gonia* Kirby, 1818 (with nearly 300 species in Africa and a few in southern and eastern Asia, the Indo-Malayan region, and New Guinea), is especially close to *Diplotaxis*. Lacordaire (1856, p. 276), when he compared these two genera, said they were very

¹ This species has also been collected during the daylight by other collectors; it is perhaps significant that its eyes are much smaller than are those of species that are nocturnal in their habits.

similar, and even some of the distinguishing characters he gives are, I find, common to both genera. The only constant difference that I discern in the small number of *Apogonia* examined is a difference in the male genitalia. The distal ends of the lateral lobes or parameres are twisted or at least most assymetrical in *Apogonia*, whereas in *Diplotaxis*, except in one or two instances, they are exactly similar and symmetrical; also the basal piece or phallobase, which is cylindrical in *Apogonia*, is flat in *Diplotaxis*. Even the larvae are apparently scarcely to be distinguished (Böving, 1942, p. 173; Saylor, 1942, p. 163), Saylor adding (*loc. cit.*) that in the case of the adults of *Diplotaxis tristis* and *Apogonia cuprescens* he was "unable to separate these two species generically, all salient characters appearing to be nearly identical." The small round pygidium of *Apogonia* and the absence of sutures on the eighth tergite or propygidium are exactly as in typical *Diplotaxis*. The *Apogonia* that I have seen have a long large labrum typical of some species of the *simplex* group of *Diplotaxis*. The "bidentate" front tibiae, said to be characteristic of *Apogonia* by Kirby, may also be tridentate, as they are in most *Diplotaxis*.

We thus see that the two genera are exceedingly similar, although, generally speaking, the species of *Apogonia* are less elongate, more roundish, than most *Diplotaxis*, somewhat like *D. bidentata* LeConte from the eastern coast of the United States. The two genera differ also in their habits, for, according to Arrow (1946, p. 20), the species of *Apogonia*, at least in India, are not taken at light at night, so that they may be more diurnal than *Diplotaxis*. This difference, together with the important difference in the genitalia mentioned above, is probably sufficient reason for keeping these two genera distinct.

The monotypic *Pseudodiplotaxis* of Nonfried, 1894 (Brazil), is said by its author to possess also the same pygidium as *Diplotaxis*, but its species, *albosetosa*, differs, he says, in the head, form of the eyes, thinner body build, complete lack of raised costae, and keel on the corner of the eyes, also in different antennae and palpi. I have not been able to examine any specimens of this genus.

The genus *Pachrodema* Blanchard, from Argentina, consists of nine species, of which

I have seen only one, *pruinosa*, which differs from *Diplotaxis* by having an elongate pygidium, large sixth ventral segment, long coxal pieces, and widely separated, not contiguous, posterior tibial spurs. The male genitalia, however, are of the same general type.

Saylor's *Triodonyx* (Mexico) and his *Clemora* and *Cnemarachis* (both West Indies) are said to be close to *Phyllophaga*; the types of these genera were formerly placed in *Phyllophaga*.

The large genus *Phyllophaga* differs chiefly by having a large pygidium and, as in *Apogonia*, entirely different male genitalia.

The species of *Diplotaxis* are the only scarabs in the northern part of the Western Hemisphere that have such a small, well-exposed pygidium, and as such can be readily recognized, at least in the United States and northern Mexico, but the size of the pygidium is, after all, relative, and from central and southern Mexico southward to Panama the pygidium is quite large and less exposed by the elytra in a number of the species, and thus approaches that of some species of *Liogenys* Guérin, 1830,¹ a South American genus of about 60 species. There is no doubt that *Diplotaxis* and some species of *Liogenys* are very similar, but the larger species (12 to 15 mm.) of *Liogenys*, such as *palpalis*, the type of the genus, differ from *Diplotaxis* in a number of important characters. No modern study of *Liogenys*, taken as a whole, has been published, and I suspect that the species currently placed in that genus represent in fact a polyphyletic assemblage. For instance, I have removed from it two species that, though originally described in that genus, are, I find, typical *Diplotaxis*, and Gutierrez (1951) has removed some Chilean species to the genus *Pacuvia* Curtis. Until a thorough revision can be made, I believe that to merge *Liogenys* and *Diplotaxis* would, moreover, cause much nomenclatural confusion, creating a number of homonyms, because Moser, who worked on both genera, gave the same names to quite a few species.

Typical *Liogenys* inhabits South America, two of its species (*quadridens* and *macropelma*) ranging north to Panama, and one (*pubis-*

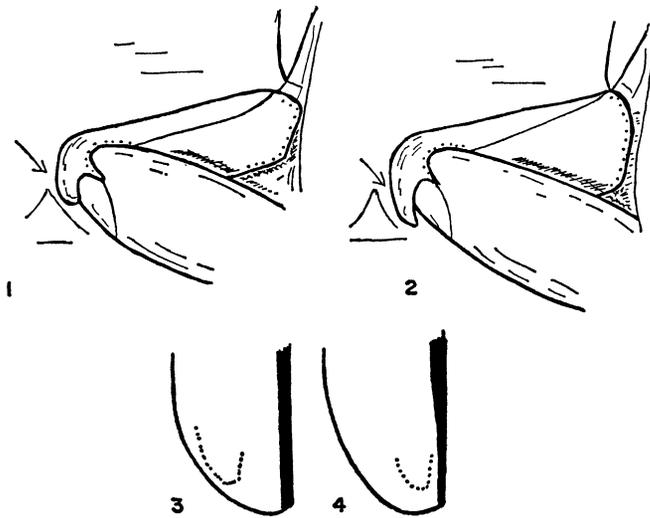
¹ Not 1838, as often given, according to Blackwelder (1957, p. 1103).

ternis) to southern Mexico; *Diplotaxis* reaches the southern limits of its range in Panama with two species (*poropyge* and *zeteki*). The two genera thus tend to represent each other geographically, although they do show a slight overlap on the periphery of their ranges. They are closely related but probably evolved independently, one in North America and one in South America. The few species that are now sympatric, probably as the result of secondary expansion, are no longer congeneric in my opinion.

A comparison of typical *Diplotaxis* and of typical *Liogenys* follows. The latter differ

pads, below, and by having long hairs on the metasternum. Most of these typical species have in addition a large, extruded sixth ventral segment, the hind tibial spurs separated, not contiguous as in *Diplotaxis*, and the antennal club often longer than the rest of the antennae. The male genitalia appear to be of the same general type in both genera, although the small sclerotized plate, which with its apodemes encloses the internal sac (fig. 8), differs in shape in the few *Liogenys* dissected.

Some of the species now included in *Liogenys* do not have all the above characters,



FIGS. 1-4. Differences between the genera *Diplotaxis* and *Liogenys*. 1. Left hind coxal plate and femora of *Diplotaxis*. 2. Same of *Liogenys*. 3. Apex of left elytron of *Diplotaxis*, showing sutural interval and subapical callosity. 4. Same of *Liogenys*.

from *Diplotaxis* by having the pygidium proportionately larger, also longer than wide, the hind coxal plate at center extended farther posteriorly (figs. 1, 2), the sutural interval of the elytra narrowed before the apex (figs. 3, 4), the narrow part being somewhat elevated, the hind tibiae flatter, with a sharp, often carinate, not rather rounded inner edge, and the subapical callosity of the elytra situated farther from the margin and nearer the suture (figs. 3, 4). Males of typical *Liogenys* differ further by having extremely elongated, rather flattened, and enlarged tarsal segments on both front and middle legs, these segments furnished with thick hairy

or they have them less well marked. Thus in some species examined, the hind tibiae are not carinate within nor do they have the spurs separated; the tarsi may be only moderately enlarged in the male, and the antennal club may be just as short as in *Diplotaxis*. A few *Diplotaxis* (*D. puberea* group; *D. pilifera*) approach some species now placed in *Liogenys* not only in the larger pygidium mentioned above, but also by having the front tarsi of the males strongly enlarged and clothed with hairy pads below. The large pygidium in these forms of *Diplotaxis*, however, is wider than long, not longer than wide as in *Liogenys*, and the enlarged tarsi of the male are present

on the front legs only, not also on the middle legs as in *Liogenys*. Tarsi with hairy pads may occur in both sexes in *Diplotaxis*. Although I have examined the majority of Moser's types of *Liogenys* in the Zoologisches Museum in Berlin, these constitute only one-half of the species that have been described, and I have not seen the females of many species. Whether the latter, as is true occasionally in *Diplotaxis*, have some of the male secondary sexual characters (as hairy tarsal pads), or any distinctive female characters, cannot be said at present.

The habitat of the species of *Liogenys* is about the same as what is known about *Diplotaxis*. According to Gutierrez (1951, p. 130), the Chilean species are crepuscular and nocturnal, hiding and hard to find in the daytime, and the adults attack trees and bushes of no economic importance.

GENERAL MORPHOLOGY AND PHYLOGENY

Individuals of the genus *Diplotaxis*, which range from 6 to 14 mm. in length, are quite uniform in shape, although some are a little more elongate, or rather more stout, but about as in figure 62. The color also shows little differentiation, ranging from nearly transparent yellow or tawny to dark brown, deep red-brown, piceous, or jet black. A few species have a green or coppery sheen when viewed in certain lights, and three have distinctly bicolored phases (pronotum dark, with elytra yellowish or reddish). Although some species appear to be always dark or always pale in color, the majority of species possess both dark and pale individuals. The color therefore is not a reliable character.

Aside from the secondary sexual characters (see Sexual Dimorphism below), there are only a few apparently positive "either/or" characters in this large genus. These characters are diagnostic of species or groups of species, with a few exceptions, but in my opinion they cannot be used for the separation of generic or subgeneric groups. They are: the dorsum either is pubescent, including scaly hairs, or not (46 species are pubescent); the sides of the abdomen either have a chitinous ridge (23 to 25 species), or not; the labrum is either divided (cleft) (11 species), or not; the antennae have either nine segments (eight species), or 10; the claws are

toothed at the middle (about 30 species), at the apex (most species), or not at all (one species); some parts of the body either have opaque, eroded areas (about eight or nine species), or not; the wings are either vestigial and abbreviated (about 12 species), or fully developed; the elytral costae are either impunctate (10 species), or punctate.

The above characters are called "apparently" positive, because they are not always sharply marked, nor are they always present or absent where they should be. As a result, some species straddle the "either/or" categories. Thus although only about a fourth of the species are considered by me to be dorsally hairy, the majority of the glabrous species actually have tiny hairs in the dorsal punctures, although they generally cannot be seen except under very high magnification; examples of such borderline cases are *fissilabris*, *knausii*, *guatemalica*, and *alutacea*, to mention a few. In addition, there is a group of 20 or 30 species that have hairs on the clypeus, but not usually on the rest of the dorsum, and these also fall between the hairy and glabrous groups. The ridge on the sides of the abdomen may be so faintly elevated in some members of a "ridged" species as to be no longer a ridge, merely a sharp edge; conversely individuals of some species without the ridge do sometimes show at least a sharp edge. Likewise, erosions are not always present in normally eroded species, and one species (*fimbriata*) has both full and abbreviated wings in the same populations.

Species that have one or more of the above characters are not necessarily related, but some are. Thus three of the hairy species which have the abdomen ridged, the labrum bilobed, the antennae 10-segmented, and the claws subapically cleft seem to form one group (*cribulosa* group). On the other hand, the six species of the *hebes* group that agree with one another by having nine segments in the antennae, the labrum emarginate, and the surface usually eroded, differ nonetheless by having the abdomen ridged in some species, but not in others, and the claws either subapically or medially toothed, and by showing no correlation between these two sets of characters (abdomen and claws). A number of species that have the labrum divided are undoubtedly closely related, but others seem

to be not at all related. Two large groups in the United States (the *brevicollis* and *haydenii* groups) have similar labrum within the group, but differ in the dentition of the claws.

This lack of correlation between characters disturbed Fall in his attempt to place the species into natural groups. In his revision of 1909 he says (p. 2), "There seems to be an entire lack of definite association of taxonomic characters, which are so completely intercurrent that it is virtually correct to say that if any one of these common to a considerable number of species be selected as a point of departure, all of the others will be represented in the group of species thus segregated." I have had similar difficulties and rather than placing a particular species in a group to which it may not belong, I have treated it by itself. Thus five of the 19 "groups" (*rugosifrons*, *guatemalica*, *arizonica*, *aurata*, *mus*) studied in this part of the revision are monotypic.

LeConte, in his synopsis of the Melolonthidae of the United States (1856, p. 266), classified the "now quite numerous" 29 species chiefly on the dentition of the tarsal claws, the prominence of the posterior spiracle, and the shape of the clypeus. About half of his species fall into a group that has the spiracle not prominent, the claws toothed at the apex, the clypeus variable, the pronotal angles not impressed, and the head not carinate; this category includes the great majority of species known at present. Bates (1887-1888) grouped the species from Mexico and Central America according to the shape of the clypeus which also puts the majority of species together (under clypeus trapezoid in shape). Fall (*loc. cit.*) merely arranged the hundred or so species found in the United States in the order in which they came in his key, placing first the 13 species with pilose dorsal surface, even though they "do not constitute a natural group," then the remaining species according to the mentum and other characters.

The groups I have made are not entirely satisfactory and have had to be based on varying combinations of characters. Some of the characters used are the shape of the labrum, mentum, clypeus, or pronotum, the number of antennal segments, the kind of pilosity, if present, the size of the eyes, the

dentition of the claws, secondary sexual characters, and so on. Many of the hairy species are grouped with other hairy species, but three of the groups (*puberea*, *moerens*, *simplex* groups) are composed of both hairy and glabrous species. In the absence of biological, physiological, and behavioral data, morphological characters have been relied upon, and those species that most resemble one another are presumed to be the most closely related. Of course some of these "related" species may in reality represent examples of convergent adaptations.

If we may judge by present-day characters, the putative ancestral *Diplotaxis* was a small, hairy, tawny form which inhabited the south central region of Mexico (northern Oaxaca north to Hidalgo) and had apically cleft claws, 10 segments in the antennae, a sharply dentate or angulate clypeus, the labrum short and flat, and the mentum rather flat without apparent declivity. Morphological differentiation, as the number of species evolved, may have been expressed chiefly in sharp differences in the male genitalia. Such forms are in contrast to many species from northern Mexico and the southwestern United States which are large, glabrous, and dark in color, and which have the claws either apically or medially cleft, the clypeus with rounded angles, the labrum long, or at least conspicuous, the mentum with a noticeable anterior declivity that is both ridged and pubescent, and the male external genitalia very similar among species. I do not know what significance, if any, the hairy vestiture has in the phylogeny of these beetles. Only one-third or one-fourth of the species have noticeable dorsal hairs, but the farther south one goes, the higher the proportion of dorsally hairy species, perhaps two-thirds of the hairy species occurring from central Mexico southward.

An evaluation of some of the taxonomic characters used in this study follows:

The dorsal surface is glabrous in the majority of species, hairy in about one-fourth, scaly in four species only, and partially glabrous, partially hairy in about one-sixth. This is approximately the same proportion found in the *Phyllophaga* by Luginbill and Painter (1953) who use the hairy, scaly, and glabrous body covering for their three main divisions of the genus. In *Diplotaxis* the pygidium and

under surface always have hairs, as well as the legs, and usually the margins of the pronotum and elytra. The marginal hairs of the elytra have not been used previously as a significant character (although Fall mentions them for *fimbriata*, in which they are exceedingly long), but in some sections of the genus they are of value for the determination of species; in a few species no marginal hairs are visible. The length of the dorsal hairs is not so important as the arrangement or pattern, whether they are absent from certain rows of the elytra (see fig. 69), or are absent from the head and pronotum but present on the elytra.

The mentum is a useful but relative character, its shape and size and the conformation of the mental declivity being characters on which Fall based the greater part of his

digging or pushing through the soil. The clypeus is generally much wider than long, but occasionally is nearly quadrate; it is from one-third to one-half of the length of the head (the head measured from the clypeal suture to the vertex), sometimes as long as the head. Of course when the head protrudes from the pronotum or when the front margin of the clypeus is worn, the relative lengths are no longer meaningful. The hairiness of the clypeus in otherwise glabrous species is a character that has not been mentioned previously. This character sets off a large group of species from the rest of the genus which has been called tentatively the *trapezifera* Bates group (although there are probably earlier names), a group with similar labrum, mentum, claws, and clypeus, but distinctive male genitalia.



FIGS. 5-7. Three typical claws (hind tarsi) of *Diplotaxis*. 5. Medially toothed. 6. Toothed just in front of middle. 7. Bent angularly, cleft subapically.

key and classification. It is often difficult to see the mentum, and I find the labrum equally diagnostic, although Fall mentioned it only if it were not "broadly arcuately emarginate." The labrum differs among species not only in the shape of the front margin (slightly or strongly arcuate, nearly straight), but also in the width and length (the latter as compared with the length of the reflexed under side of the clypeus), in the degree of convexity or concavity, and in the punctuation (the latter rather variable). In most sections of the genus the labrum is also a useful group character, at least in the sense that closely related species tend to have the same labrum, although species with the same labrum are not always closely related.

The clypeus, which, with the claws and mentum, Fall considered a most important diagnostic character, takes many shapes and is quite variable within the species, sometimes also sexually variable, the males having the angles sharper or longer than the females. The angles are often worn, probably from

A few species with the same kind of vestiture, however, do not seem related to the *trapezifera* group (*ohausi*, *zeteki*, *cribriceps*, *errans*).

The claws are important for the differentiation of species in only a few instances, because the majority of species have the same type of claw, i.e., abruptly bent at the middle and toothed or cleft near the apex (fig. 7) so that the apices of both tooth and claw are nearly contiguous and are at the same level. The other general type of claw, found in only about 30 species, is scarcely curved, and the tooth emerges from the middle of the claw, its apex being distant from the apex of the claw, usually midway between the base and the apex (fig. 5). Some claws are of a type between these two (fig. 6), and the males of some species have the front claws modified in various ways (figs. 38-40). Although Fall (*loc. cit.*) illustrated 38 different claws as well as 33 kinds of clypeus, it seems to me that the differences are so slight, especially in the claws, that the smallest degree of individual variation would make iden-

tification most doubtful; also the claws often are slightly different on the front and the hind tarsi and may differ between the sexes. The majority of the species with the medially toothed type of claw come from the northern part of Mexico or from the United States (*carinata* from Jalisco in central Mexico is an exception, and there may be others), and they are glabrous, not hairy (with one or two possible exceptions). One might consider such species to be less primitive because the tooth has moved farther posteriorly (on the way to becoming obsolete?), for, according to Arrow (1946, p. 19) in his discussion of toothed (at middle) and cleft (at apex) claws, "The fact that in every case the toothed form is that of the female is perhaps to be explained by the supposition that this is the more primitive condition and that, as is frequently found, it is the male which has undergone modification." In *Diplotaxis* the males of a number of species have already lost the tooth of the claw on one pair of legs, but these happen to be species with the other claws cleft at the apex, not at the middle. The loss of an antennal segment is also considered by some authors to denote a less primitive, more specialized condition, but the *hebes* group, all of which have only nine, not 10, antennal segments, nevertheless has both kinds of claws, either toothed or merely cleft. The hairy species *rudis*, on the other hand, not only has nine-segmented antennae, but also has lost the tooth of the claws on all legs and in both sexes.

The eyes are always partially divided by the extension of the clypeus; they are large even in those few species that seem to be diurnal and have smaller eyes than the others. The largest part of the eye is hidden by the front angles of the pronotum, so is not visible from above. If the head is not drawn back too far into the pronotum, the size of the eyes can be judged in relation to the width of the head across the eyes, "large" eyes being each about one-quarter of the width of the head, "small" ones about one-sixth or one-seventh. The eyes are often bigger in males than in females.

The antennae, which Fall found "monotonously similar in structure" throughout the genus, differ among some species slightly, as he said, in the proportions of the length of

the club to the funicle, but these proportions are difficult to establish, and they are also often sexually dimorphic and individually variable. Eight species have nine instead of the usual 10 segments in the antennae, but only one such species was known by Fall.

The pronotum varies by being flat or convex, by being longer or shorter in proportion to the length of the elytra, by the shape of the side margins (gently curved, angulate, nearly straight, sinuate at base or apex), and the shape of the front and hind corners (right, obtuse, or acute angles, or corners rounded off). Most species have a slight depression, or dimple, on the sides in front of the middle, and the base of the pronotum is often denticulate (usually not visible in small species or in specimens with the pronotum and elytra pressed together).

The scutellum is shield-shaped, variable in punctuation within the species. In two species (*pubipes* and *maya*) it is unusually small, and in species with abbreviated wings it tends to be broader.

Each elytron has nine rows of punctate striae, five of which are shown by arrows in figure 69. When counted away from the sutural, or first, stria, the second and third and the fourth and fifth striae are paired (the "geminate striae" of Fall and others), and these paired striae enclose the narrow intervals, often called the costae, which are usually furnished with one row of punctures in the center, occasionally impunctate. They are often slightly convex, thus giving the elytra a ribbed or costate appearance. They are much more prominent in some species than in others; in many of the Mexican species they are scarcely distinguishable from the very broad intervals on each side, and in a few species they are almost obliterated because of dense and confused punctures. The punctuation of the elytra is variable in size and density within the species but is recognizable for a given species within certain limits. Thus a number of species are characterized by having the second broad interval with but a single row of punctures instead of the usual two or three rows. This single row, however, is sometimes so irregular as to appear a double row, at least apically, so that more than one specimen of a species is necessary for identification. The punctuation is judged with the specimen

tipped forward into the light.

The front tibiae are the typical digging tibiae of the scarabs. The relative positions of the second and third outer teeth to each other and to the apical projection are diagnostic within limits, but often of little practical value because of the blurring of the angles and the apex by wear. The middle and hind tibiae may be nearly straight throughout, as in the *puberea* and *ohausi* groups, but generally the outer edge is interrupted at the middle or beyond by the setose carinae that often extend across the face of the tibiae; these carinae apparently differ specifically, but are entirely too variable for reliability. The hind tibiae are narrowed or constricted before the somewhat outward flaring apex in most species. The relative lengths of some of the tarsal segments differ among species and between the sexes. In some species (*puberea* group) both sexes have thick hairy pads on the under side of the tarsi, in some only the males have pads, and in others neither sex has pads, but only scattered hairs or setae. The tibial spurs, one on the front tibiae and two contiguous ones on each of the others, vary in length and thickness in some species, and also between the sexes.

The abdomen, except for the chitinous ridge present laterally in some species and the sexual differences, varies among species in only a few respects. The sixth ventral segment is longer and more exposed in some species (*pilifera*, *hallei*, *knausii*, *juquilensis*, and others), and in some of the *puberula* group it is usually exposed in the female and has tiny serrations at the middle. A deep transverse groove and ridge are present in many species above the pygidium (on the propygidium), absent in others, and faintly present in still others. Some species have swellings or tubercles or a series of rugae in the center of some of the segments, these being constant in some species but variable in others.

SEXUAL DIMORPHISM

Sexual dimorphism is well marked, and Fall in his revision (1909, pp. 5-6) lists about a dozen sexual characters. He remarks, nevertheless, that "it is rarely possible to determine the sex of a single specimen, and even in a considerable series containing both sexes,

they can rarely be separated with certainty." Many authors may have had the same difficulty, because they did not indicate the sex of the specimen they selected as the type of the new species being described. I find, however, that after some practice it is easy to determine the sex, without dissection, in the great majority of the species, particularly those from Mexico and farther south.

The most reliable character seems to be the length of the first segment of the hind tarsi relative to the length of the longer of the two tibial spurs. In females this segment is usually noticeably shorter than the spur, and both the spur and the segment are wider than in males of the same species. In the males, the first segment is as long as or longer than the spur (the only group of species in which this character is generally not reliable is the *trapezifera* group, composed of species with the clypeus hairy but the dorsum glabrous). An equally good but less readily measurable character is the shape of the pygidium, which is broader, more transverse, in the male, not equal-sided or slightly pointed at the apex as in the female. In the male the pygidium is often retracted or bent under owing to the shortness of the fifth abdominal segment, which is often shorter than the fourth at middle in the male, but the same length in the female.

Additional characters distinguishing males and females are given with the description of each group of species. Briefly these are that the males have longer tarsi; longer and narrower hind tibiae, with less apical flare and less prominent setose carinae; narrower, less robust, hind femora; rather stouter, slightly longer, but usually less bent tarsal claws. In some sections of the genus males have the angles of the clypeus sharper and the eyes larger than the females, and the abdomen flat or concave, not rounded.

In some species and groups of species, males have very definite characters which are as follows:

Abdomen sericeous, with "silky shimmer": *hebes* group (*abnormis*, *carinata*, *cribratella*, *hebes*, *mima*).

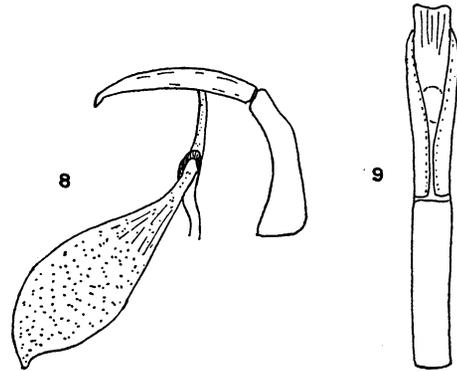
Abdomen at center with long dense golden hairs: *brevidens* group (*brevidens*, *fossipalpa*, *illustris*). Hind tibiae on inner side fringed with long dense golden hairs: *anthracina* (some males), *anxius*,

- blanchardi* (some males), *brevidens*, *fossipalpa*, *illustris*, *knausii* (some males), *moerens* (some males).
- Middle tibiae prolonged at apex into long triangle (fig. 75): *arizonica*.
- Middle tibiae with apical spurs so short as to be scarcely visible among the apical spines and hairs: *pilifera*.
- Front tarsi with inner claw two or three times longer than outer claw and much larger; *anthracina*.
- Front or middle tarsi with claw tooth obsolete or virtually so: *anxius*, *fossipalpa*, *mus*; or with tooth flattened or enlarged or partially fused with claw: *ambigua*, *anthracina*, *bowditchi*, *brevipilosa*, *microtichia* (some males), *planidens*, *puberea*, *simillima*, *zeteki*.
- Front tarsi with all segments markedly enlarged and with hairy pads below: *brevipilosa*, *microtichia*, *simillima*.
- Front tarsi (some or all segments) clothed with hairy pads below: *ambigua*, *anthracina*, *brevisetosa*, *dubia*, *hallei*, *pilifera*, *planidens*.
- Front tarsi with first segment triangularly enlarged (fig. 49) and second segment carinate at base on outer side: *knausii*.
- Middle tarsi with first segment notably widened at apex and prolonged into blunt spine (fig. 33): *spina*, *pilifera*.
- Maxillary palpi with last segment enlarged, dilated (fig. 24): most of the *puberea* group (*bowditchi*, *brevipilosa*, *maya*, *puberea*, *spina*, *tarsalis*).

The only definite characters of the female that I have found are the concave, hollowed-out pygidium of *pilifera* and the very wide hind tibial spurs (fig. 60) in some species (*hirsuta*, *puberula*, *rita*, *subrugata*).

IMPORTANCE OF THE MALE GENITALIA

Fall is the only worker on the genus who mentions the male genitalia which he found (1909, p.6) "quite simple so far as examined." It is true that some of the species from the United States have quite simple, also quite similar, male genitalia (*brevicollis* and *haydenii* groups, and others), but other species, such as *fossipalpa* and *illustris*, and also the majority of species from farther south, have these organs quite distinctive. Some of the extremely similar species of the *trapezifera* group can be distinguished with certainty only by differences in the male genitalia. I am referring to the external parts which include two elongate, symmetrical, sclerotized, lateral lobes (or parameres) articulated to a



FIGS. 8, 9. Typical male genitalia of *Diplotaxis*. 8. Side view of lateral lobes and basal piece, with internal sac emerging below. 9. Dorsal view of lateral lobes and basal piece, with median lobe or phallus emerging through orifice, but not unfolded.

thin, rather flat basal piece or basal plate (or phallobase or gonocoxite) of approximately the same length as the lobes (figs. 103-158). In the figures only a part of the basal piece is shown. The median lobe (or phallus, penis, aedeagus) is membranous and not visible except when everted, at which time it emerges through the lateral lobes (fig. 9). The male genitalia seem to conform to the vaginate type, type 3, as given by Tuxen (1956, p. 73, fig. 77).

The external genitalia differ from species to species in the shape of the lobes as seen dorsally and in the shape of their apices as seen in profile, also in the junction of the inner sides of the lobes, whether they are joined nearer the base or nearer the middle. These organs, as do many of the other characters of the genus, show slight but constant differences, but allowance must be made for some distortion in dissection, because the lobes are not invariably so strongly sclerotized. Where sufficient numbers of specimens were available to me, many males of each species were dissected.

The internal sac (or vesica) of the male genitalia has been investigated in a few species, but the illustration and discussion of these have been considered too lengthy for this paper. A typical profile view of the lateral lobes and basal piece is shown in figure 8, with the internal sac depending from them; the sac is enclosed by the rods or apodemes which are attached to a small sclerotized plate in

the shape of a horseshoe. The sac is shaped differently in some species, and occasionally the membranous walls possess an armature of small hairs or bristles within. A separate study of the internal parts is projected for the near future.

According to Fall (*loc. cit.*) the female organs "are entirely membranous and therefore useless for comparison." Dissection of the internal parts has been made on some species but without its revealing any marked differences. Further study, however, is needed before any conclusions can be drawn.

For the extraction of the male genitalia, a bent pin and a relaxed beetle are all that are essential. I find it easiest to hold the beetle either sideways or upside down between thumb and finger so that the pygidium can be pulled open from the apex of the abdomen. The pygidium is hinged at the base and opens in the manner of a trap door. If the organs are just inside, they are readily pulled out with the bent pin, but if they are far within the abdominal cavity, they may be difficult to find. In this case the entire abdomen may be removed and the genitalia extracted from the wide end of the abdomen. The eighth sternite, of which some diagrams are shown in figures 84-89 and which is about the same length as the lateral lobes, usually comes out with the genitalia upon dissection.

COLLECTORS OF RECENT MATERIAL

A partial list, by year, of collectors whose material from Mexico and Central America has been used includes: 1940-1949, R. P. Allen, A. Bierig, G. M. Bradt, T. H. Hubbell, J. and D. Pallister, R. W. L. Potts and J. and R. Potts, B. Malkin, R. R. Miller (in Guatemala), W. Nutting, Ross and Bohart, P. and C. Vaurie (in Guatemala), H. M. Wegener, F. Werner; 1950, J. Figg-Hoblyn, Goodnight and Stannard, M. Sanchez R., R. F. Smith; 1951, O. L. Cartwright (in Guatemala), K. Hinchcliff, P. D. Hurd, Jr., Langebartel and Abbuhl, J. D. Lattin, L. J. Stannard; 1952, Cazier, Gertsch, and Schrammel, H. T. Dalmat (in Guatemala), E. E. Gilbert, C. D. MacNeil, W. Miller, R. K. and B. J. Selander, C. and P. Vaurie, F. W. and F. G. Werner; 1953, R. C. Bechtel, T. J. Cantrall, B. Malkin, E. I. Schlinger, R. K. Selander, C. and P. Vaurie; 1954, Cazier, Gertsch, and the

Bradts, R. K. Selander; 1955, R. B. and J. M. Selander, C. and P. Vaurie, E. C. Welling; 1956, T. J. Cantrall, R. and K. Dreisbach, T. H. Hubbell, B. Rotger; 1957, B. Heineman (Jamaica), R. B. and J. M. Selander.

SPECIES REMOVED FROM THE GENUS

I have seen the type of *Diplotaxis flavisetis* Bates [1888 (1887-1888), p. 165, pl. 9, fig. 26], from Tapachula, Chiapas, Mexico, and find that it is not a member of this genus, the pygidium and mentum being quite different. The clypeus is bilobed as in some *Phyllophaga*, the fifth abdominal segment is large, the sixth exposed; the elytral are not striate; the middle tibiae have only one spur; the front tarsi have hairy white pads; and the surface is pubescent.

The other species not belonging in the genus was described by Nonfried (1894, p. 116) as *Diplotaxis Wittkugeli* from "central Honduras." I do not know where Nonfried's types are; his collection was evidently broken up and dispersed, but Moser must have seen them because he wrote an article entitled "Bemerkungen zu einigen Nonfriedschen Arten (Col.);" (1912, p. 325). Among the species listed is the present one which he says is a species of *Apogonia* of the Indian region. This genus is very similar to *Diplotaxis* but does not occur in the New World.

TREATMENT

The species groups that contain more than three species are furnished with a short introductory paragraph, a diagnostic description (including characters that are similar for all the species of the group and that are not repeated for the species), a key, and a discussion. The discussion may include the mention of additional characters, or distribution, also the number of specimens seen, which types were examined, comparison with other groups, and so on. In the smaller groups, with the exception of the *brevidentis* group, the diagnostic characters are given along with the characters of the first species of the group. The formal descriptions of the species themselves have been kept to a minimum by a system of comparison of the subsequent species with the first species of the group. The name of the group is given by the species described earliest. In the Appendix,

locality data for Mexico and southward are given more fully than data for the United States, because those regions are less known.

A key to the hairy species, following the key to species groups, is supplied for the sake of convenience. The dorsal hairs are readily visible on the majority of those species possessing them, which constitutes a definite character in a genus notably lacking definite characters. The hairy species and species groups are to be found in their appropriate sequence as given in the Contents. (For dis-

cussion of general morphology, see above.)

Some of the larger groups to be discussed in part 2 of the revision include species with the elytral costae impunctate (*atramentaria* and others); the elytral costae impunctate and the abdomen ridged laterally (*truncatula* or *arctifrons* group); the wings vestigial (*conata*, *corvina*, and others); the labrum very arched in front and its center hollowed out (*brevicollis* group); and species with the front tibiae virtually bidentate (*subcostata* and others).

SYSTEMATIC TREATMENT

GENUS DIPLLOTAXIS KIRBY

Diplotaxis KIRBY, 1837, p. 129. Type, by original designation and monotypy, *Diplotaxis tristis* Kirby.

Orsonyx LECONTE, 1856, p. 265. Type, by original designation and monotypy, *Orsonyx anxius* LeConte.

Alobus LECONTE, 1856, p. 273. Type, by original designation and monotypy, *Alobus fulvus* LeConte.

Diazus LECONTE, 1859, p. 10. Type, by original designation and monotypy, *Diazus rudis* LeConte. New synonymy.

DIAGNOSIS: Differs from related genera either in the type of male genitalia or in a combination of three characters: the complete absence of visible sutures between the propygidium and the fifth ventral segment, the small, rather round or elliptical, but not elongate or triangular pygidium that is entirely exposed by the elytra, and in the short, rarely exposed, sixth ventral segment.

RANGE: In Western Hemisphere from Panama north to Canada.

GENERIC CHARACTERS: Middle and hind tibiae each with two apical spurs that are contiguous and usually of unequal length, and with one or two transverse or oblique setose carinae on outer side, which are often inconspicuous, especially in males, tibiae cylindrical. Front tibiae each with two teeth on outer edge in addition to apical tooth, the basal tooth sometimes farther removed from the others, sometimes obsolete. Hind coxae one-half or less of the length of metasternum at middle; front coxae prominent, conical. Pygidium more or less round, propygidium partly and pygidium entirely exposed by elytra, propygidium without perceptible sutures between it and fifth ventral segment, forming a "ring" around pygidium. Posterior spiracle usually prominent at edge of elytra between fifth ventral and propygidium. Sixth ventral segment usually small and not exposed. Tarsal claws cleft at middle or apex, but without any tooth in one species. Elytra with nine punctate-striate rows, the second and third and fourth and fifth in pairs on each side of the narrow intervals (the costae).

Front margin of clypeus variable in outline (round, semicircular, biangulate, bidentate,

sinuate-emarginate, bilobed); mandibles not visible from above; labrum free from, not fused with, clypeus, not visible from above except slightly in one species, concave, flat, convex, or divided; antennae with nine or 10 segments, the club three-lamellated; wings present, but sometimes abbreviated or vestigial; dorsal surface pilose, setose, or glabrous; color usually yellow to brown to black; size generally small, but from 6 to 14 mm.; male genitalia with chitinized symmetrical parameres or lateral lobes and a basal piece of approximately same length, the non-chitinized, membranous, median lobe not exposed.

DISCUSSION: The monotypic genus *Orsonyx* was synonymized by Fall (1909, p. 2) because it was "founded on a secondary sexual character of the male [front claws with the tooth virtually obsolete] and is therefore untenable," with which I agree. *Alobus*, also monotypic, was synonymized by Vaurie (1956, p. 4), its one species, *fulvus*, being a typical *Diplotaxis*. Fall was doubtful of the validity of both *Alobus* and *Diazus*, but he did not put these names in synonymy, and they are still carried in the catalogues. *Diazus* was described by LeConte for one species, *rudis*, which differs from other species of *Diplotaxis* by having all the tarsal claws simple (not toothed) in both sexes. As explained under the species, this character occurs in males of a few other species, and the tooth is partially fused on the front or middle legs in still others. The species *rudis* has a number of other rather distinctive characters, but it is so similar to *rex*, which has normal claws, that in my opinion it belongs in *Diplotaxis*. (For discussion of related genera, see above.)

KEY TO SPECIES AND SPECIES GROUPS

1. Occurring in Martinique, Lesser Antilles, only *ebenina*¹
Occurring elsewhere than in Martinique 2
2. Clypeus hairy (best seen in profile), but rest of dorsum glabrous, or nearly so 3
Clypeus either not hairy, or clypeus as well as some other part of dorsum distinctly hairy, or with scale-like hairs 7

¹ Not examined; see Incertae Sedis.

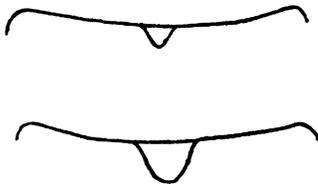


FIG. 10. Small and large scutella of *Diplotaxis*.

- 3. Scutellum proportionately very small (fig. 10) *pubipes* (*puberea* group)
Scutellum normal in size 4
- 4. Sides of abdomen with a longitudinal elevated ridge as in figure 11, often hidden under edge of elytra; Guatemala, Costa Rica *guatemalica*
Sides of abdomen smoothly rounded, not ridged 5

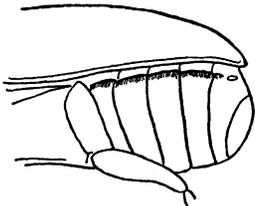
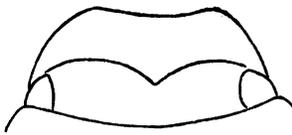
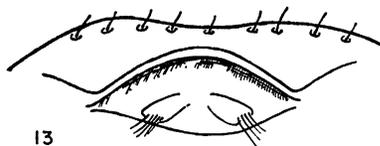


FIG. 11. Ridged abdomen of some *Diplotaxis*.

- 5. Antennal club dark or black; size small (7 to 8 mm.); or if club not dark, then dorsum distinctly bicolored (pronotum dark, elytra brown or tawny) *aenea* group
Antennal club pale or tawny; pronotum and elytra same color 6
- 6. Mentum declivous in front, declivity strongly ridged behind; hind tibiae long,



12



13

FIGS. 12, 13. The *simplex* group. 12. Sinuate or backward-bent clypeal suture. 13. Long labrum compared with reflexed under side of clypeus.

- straight; clypeus abruptly indented at sides *ohausi* group
Mentum flat throughout, with perhaps a few hairs where ridge of declivity should be; or if declivous, then tibiae and clypeus not as given above for *ohausi* group *trapezifera* group¹

- 7(2). Species considered dorsally hairy (at least some hairs or scales emerging from elytral punctures)²
. (see below, key to hairy species)
Species considered dorsally glabrous (no hairs on dorsum, excluding marginal hairs of elytra and hairs of pygidium) 8
- 8. Tarsi with thick hairy pads ventrally, hairs obscuring surface beneath (fig. 34) *puberea* group
Tarsi with normally hairy soles 9
- 9. Antennae with nine segments only; wings full; Arizona and New Mexico south to Mexico City *hebes* group
Antennae with the usual 10 segments . . 10
- 10. Species from central or southern Mexico southward; claws cleft subapically; labrum either flat or slightly concave and not advanced beyond level of reflexed under side of clypeus, labrum twice as long as under side of clypeus (fig. 13); or, if not quite twice as long, then either clypeal suture sinuate or bent backward angularly at middle (fig. 12), or front of head with an interrupted transverse carina *simplex* group
Species from extreme northern Mexico or the United States with perhaps some but not all of the above characters 11
- 11. Large beetles (11 to 14 mm.) with following characters: entire center of metasternum broadly depressed, sides of depression tumid; claws toothed medially; pronotum strongly sinuate (fig. 51); hind femora and tibiae with very long hairs (fig. 50); southern Arizona and California, also Sonora, Mexico . . . *fossipalpa* (*brevidens* group)
Not entirely as stated above 12

- 12. Labrum either bilobed, cleft at middle, and with the sides rather prominently drawn forward (fig. 14), or labrum not quite cleft but deeply concave throughout its

² Some doubtful species are included in keys to both hairy and glabrous forms, as *jamaicensis* and *alutacea* of the *simplex* group, *guatemalica*, and *knausii* and *fissilabris* of the *moerens* group, all of which have the elytral hairs very inconspicuous.

¹ A group of 30 or 40 species that will be treated in part 2.

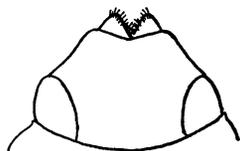


FIG. 14. Bilobed or cleft labrum of *Diplotaxis knausii* (the most deeply cleft species).

center; tarsal claws usually bent abruptly, but at least cleft subapically (fig. 7); males with long hairs, if present, on hind tibiae only *moerens* group
 Labrum, at least in front, flat; tarsal claws gently curved, the tooth either distinctly median in position (fig. 5) or slightly in front of middle (fig. 6); males with long hairs on front and hind femora and tibiae *brevidens* group

KEY TO DORSALLY HAIRY SPECIES AND SPECIES GROUPS¹

1. Elytral costae virtually impunctate; southern Arizona, northern Chihuahua *arizonica*
 Elytral costae densely punctate 2
2. All tarsal claws simple, not toothed; antennae nine-segmented; central United States. *rudis* (*rudis* group)
 No more than two pairs of claws, if any, simple; other claws toothed; antennae 10-segmented 3
3. Labrum bilobed, cleft at middle 4
 Labrum flat or slightly concave, not bilobed 6
4. Abdomen with longitudinal chitinous ridge on sides, at least on first few segments (elytra can be pulled away with bent pin) (fig. 11) . . . *cribulosa* group
 Abdomen not ridged laterally 5
5. Labrum tiny, shallowly cleft, less than one-half of length of under side of clypeus; size small (8 mm.); dorsal hairs long, readily visible; Texas *rex* (*rudis* group)
 Labrum large, prominent, deeply cleft, longer than under side of clypeus (fig. 14); size, 9 to 12 mm.; dorsal hairs scarcely visible; southwestern United States and Sonora, Mexico, but not

¹ Species are here considered hairy if the elytra have hairs, setae, or scales on the dorsal surface. The "costae" are actually the narrow intervals and have but one row, if any, of punctures. Often they are indistinguishable from other broader intervals. "Strial punctures" separate the broad and narrow intervals. An asterisk (*) denotes the species that will be treated in part 2 of the revision.



FIG. 15. Head and clypeus, showing comparative size of eyes.

- Texas
 . . . *knausii*, *fissilabris* (*moerens* group)
- 6(3). Dorsum and venter clothed with coarse, usually white, usually depressed scales or scale-like hairs (fig. 96) 7
 Dorsum and venter clothed, at least in part, with fine, yellowish, usually semi-erect or erect hairs (figs. 62, 93) 9
 7. Clypeus either rectangular or quadrate, sides angulate, but may be blunt, front margin strongly reflexed; Mexico state south to Oaxaca 8
 Clypeus more or less rounded from side to side, without angulation, front margin not reflexed; southern Arizona and Chihuahua, northern Mexico . . . *mus*
 8. Each eye, seen from above, about one-quarter of width of head (fig. 15); pronotum with front angles acutely produced; antennal club tawny or reddish *pilifera* group
 Each eye, seen from above, less than one-sixth of width of head (fig. 15); pronotum with front angles usually obtuse or right angles; antennal club black or at least dark. . . *clypeata* (*aenea* group)
 - 9(6). Occurring in Jamaica, West Indies, only *jamaicensis* (*simplex* group)
 Occurring elsewhere than in Jamaica 10
 10. Clypeal margin rather semicircular, evenly rounded from side to side (fig. 16) 11
 Clypeal margin emarginate in front, or biangulate, or dentiform (figs. 16, 24, 93, 95) 16
 11. Elytral surface with irregular rugose swellings; elytral hairs long (four times longer than on pronotum), erect, absent from striae (known only from type specimen); Guatemala *aurata*

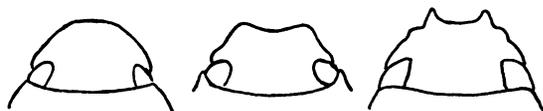


FIG. 16. Rounded, emarginate, and dentiform kinds of clypeal margins.

Elytral surface smooth, not swollen; elytral hairs either short or, if long, then present in all punctures12

12. Head and pronotum with hairs scarcely visible, or, if so, then hairs on elytra present only in punctures of intervals, not of striae; hairs usually so short as not to overlap13

Head, pronotum, and elytra either with hairs visible in all punctures, or at least elytra with hairs long and overlapping15

13. Sides of pronotum suddenly bulging at middle, thence sinuate to front and hind angles (fig. 76), pronotum transversely depressed at apex and base; Guatemala

. . . *alutacea* (in part) (*simplex* group)
Sides of pronotum evenly rounded from base to apex without sinuation (fig. 95), pronotum not transversely depressed14

14. Labrum concave at middle; middle tarsi scarcely longer than tibiae; pygidium and fifth abdominal segment coarsely, deeply, confluent punctured, southwestern United States, northern Mexico*muricata, sparsesetosa, hispida** (*corvina* group?)

Labrum flat; middle tarsi longer than tibiae by length of two segments; pygidium and fifth abdominal segment finely, densely, shallowly punctured; Durango, northern Mexico*rockefelleri* (in part) (*rockefelleri* group)

15(12). Head and pronotum densely, uniformly punctured; metasternum at middle about three times as long as second abdominal segment; wings normal; northern Mexico*indigena* (in part) (*rockefelleri* group)

Head and pronotum sparsely, irregularly punctured; metasternum at middle scarcely longer than second abdominal segment; wings reduced; Texas*brevisetosa** (*subcostata* group?)

16(10). Tarsi with hair pads ventrally, the hairs so thick as to hide the surface beneath (fig. 34)*puberea* group

Tarsi with the usual scattered hairs, no pads17

17. Tarsal claws curved gradually, toothed medially, apex of tooth nearly at middle of claw, tooth much shorter than claw (fig. 17); United States18

Tarsal claws bent abruptly, cleft subapically, apex of tooth close to apex of claw and almost of same length (fig. 17)



FIG. 17. Gradually curved and abruptly bent claws.

.19
18. Head and pronotum virtually hairless; elytra with striae punctures bare of hairs, and marginal hairs as long as scutellum is wide; California*dahli** (*brevicollis* group?)

Head, pronotum, and elytra with all punctures hairy (long or short hairs), marginal hairs of elytra short, scarcely protruding; eastern and central United States*sordida* group (in part)

19. Head and pronotum virtually hairless.20
Head and pronotum distinctly hairy (if hairs worn, some can usually be seen when viewed in profile)23

20. Pronotum with front angles acute and drawn forward; front of head slightly transversely swollen behind clypeus (fig. 59); Nayarit, Mexico*rugosifrons*

Pronotum with front angles rounded or forming right angles; front of head flat or concave; northern Mexico, Guatemala21

21. Elytra with short but readily visible hairs in punctures of all intervals; Durango, Mexico*rockefelleri* (in part) (*rockefelleri* group)

Elytra with hairs either so short as to be visible only at greater than $\times 14$ power, or present on costae only; Guatemala22

22. Margin of clypeus emarginate at middle and with prominent reflexed lateral angles; pronotum uniformly convex, sparsely punctured; abdomen usually carinate laterally.*guatemalica*

Margin of clypeus truncate, lateral angles rounded off, not prominent or reflexed; pronotum transversely depressed at base and apex, densely punctured; sides of abdomen smooth, not carinate.*alutacea* (in part) (*simplex* group)

23(19). Pronotum with front angles acute and markedly drawn forward (fig. 18); United States*sordida* (*sordida* group)

Pronotum with front angles not acute, but

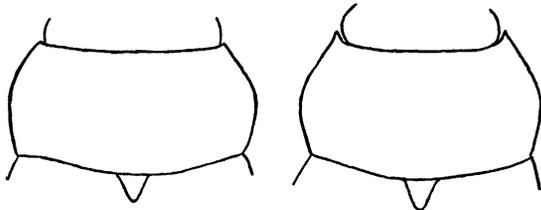


FIG. 18. Non-acute and acute or drawn-forward front angles of pronotum.

- rounded off or forming obtuse angles; United States or Mexico or Central America 24
- 24. Clypeus with front and side margins emarginate, or, if more or less straight, then lateral angles either strongly reflexed or markedly drawn forward, or sharply angulate; front margin usually strongly reflexed
 *puberula* and *pilipennis* groups
- Clypeus with front and side margins virtually straight, not emarginate and scarcely, if at all, reflexed; lateral angles broadly rounded
 *indigena* (in part) (*rockefelleri* group)

SPECIES GROUP *aenea*

The following species compose this group: *Diplotaxis corrosa* Bates, *aenea* Blanchard, and *clypeata* Bates.

The small species of this group are close to the *trapezifera* species group and in general are distinguished from them only by the piceous antennal club and the general black color, with greenish reflections, not tawny or reddish as in most *trapezifera* species. The species differ further by having color phases in which the elytra are red-brown or have red-brown stripes, whereas the pronotum is black or greenish. A few individuals are occasionally entirely brown or tawny. One species, *clypeata*, has thick white scales; the others have minute hairs so tiny that they have not previously been mentioned in the literature. The three species are characterized by having small eyes that scarcely protrude from the front of the pronotum and are widely separated (each eye is about one-sixth of the width of the head); the head convex or somewhat flattened, not concave in front; antennae with 10 segments; abdomen not ridged; the pronotum rather long, with the front angles usually acute, and an impunctate or raised

area at middle; the elytra proportionately short and strongly, rugosely punctured; the clypeus long, trapezoid, strongly reflexed, hairy; the pygidium small, densely punctured; and the lateral lobes of the male genitalia joined near base.

About a dozen specimens of *clypeata* have been examined, about twice as many of *corrosa*, and nearly 500 of *aenea*, also the types of all the forms except *aenea*. All three species occur in Mexico, *clypeata* apparently being restricted to the state of Oaxaca, *corrosa* to the northeastern and central part, and *aenea* occurring over most of the country.

There are other small dark species with hairs on the clypeus and the rest of the dorsum virtually glabrous, but these do not have the antennal club dark as in the *aenea* group. They are *parvula* Burmeister from Oaxaca, *polita* Fall from Baja California, *tepicana* Moser from Tepic, Nayarit, and *fissilis* and *glabrimargo* Vaurie and Cazier from northern Mexico. There are also other species with scale-like hairs as in *clypeata*, as the *pilifera* group from central and southern Mexico, which follows. (See under *clypeata* for comparisons.) Another quite different species with rounded clypeus and scales is *mus* Fall from the northern states.

All the diagnostic characters of the group are included in the description of *corrosa*, with which the other species are compared.

KEY TO THE SPECIES OF THE *aenea* GROUP

1. Elytra with short, white, thick, scale-like hairs in punctures of the intervals; Oaxaca
 *clypeata*
 Elytra either without hairs or with fine minute hairs that are scarcely visible at $\times 14$ power 2
 2. Punctures of pronotum very fine, usually much smaller than those of elytra, and surface smooth; base of pronotum often with transverse, convex, impunctate line; if bicolored phase, then elytra without black except on scutellum; marginal hairs of elytra usually shorter than scutellum; male genitalia as in figure 105 *aenea*
- Punctures of pronotum large, coarse, and rather confluent, as are those on elytra also, and surface rugose; base of pronotum usually densely punctured as on rest of dorsum; if bicolored phase, then elytra with two longitudinal black stripes in center and on margins, and tawny stripes between; marginal

hairs of elytra at least as long as scutellum; male genitalia as in figure 103 . . . *corrosa*

***Diplotaxis corrosa* Bates**

Figure 103

Diplotaxis corrosa BATES, 1888 (1887-1888), p. 161, pl. 9 (Alvarez Mountains, [northern?] Mexico; lectotype, male, here designated from original specimens in British Museum).

Diplotaxis corrosa var. *pachucana* BATES, 1888 (1887-1888), p. 161 (Pachuca, Hidalgo, Mexico).

DIAGNOSIS: Minute hairs present on elytra, but usually not visible. This small species lacks the long scaly vestiture of *clypeata* and is generally more coarsely punctured, especially on the pronotum, than *aenea*, but is otherwise very similar to both these forms. Some specimens are difficult to distinguish from some *aenea*, but the male genitalia differ, and the marginal hairs of the elytra are longer and more abundant in *corrosa*.

RANGE: Northern and central Mexico. Forty-two specimens have been examined as follows: *San Luis Potosi*: San Luis Potosi, 16. *Hidalgo*: Pachuca, 8000 feet, 18 (including two paratypes of "*pachucana*"). *Guanajuato*: Two. ?*Alvarez Mountains* (see below): Four males, one female (the original specimens and the lectotype).

DESCRIPTION OF LECTOTYPE, MALE: Color black, with greenish tinge. Length, 7 mm. Head with front abruptly declivous to clypeus, densely, rugosely punctured. Clypeal suture obliterated at middle. Clypeus hairy, more than one-half of the length of head, punctured as there, slightly swollen at center base, sides angulate in front of eye, thence obliquely narrowed to front margin which is deeply emarginate between the obtuse angles, and broadly, deeply reflexed. Eyes small, each about one-sixth or one-seventh of width of head. Antennae 10-segmented, club dark, as long as funicle. Maxillary palpi without dorsal impression on last segment. Mandibles small. Labrum concave at center, apparently impunctate, same length at center as reflexed under side of clypeus. Mentum with declivity in anterior third posteriorly arcuate, pubescent, and strongly margined.

Pronotum transverse, sides gently arcuate behind middle, front angles slightly acute, hind angles obtuse; densely, rugosely punctured with larger punctures than on head,

center near base with longitudinal raised impunctate area, sides at base with transverse impunctate area. Scutellum with two punctures. Elytra short, scarcely twice longer than pronotum, with minute hairs in all punctures, punctures coarse, dense, confluent as on pronotum; second interval unipunctate; costae convex and with single row of small punctures (suture also with one row); marginal hairs short, sparse, but worn in this specimen.

Abdomen not ridged laterally, fifth segment without groove. Pygidium not large, densely punctured except for a raised impunctate space. Metasternum short, scarcely longer than hind femora are wide. Front tibiae with outer teeth equidistant. Middle tarsi with first segment a trifle longer, and hind tarsi with first segment a trifle shorter, than second segment; hind tarsi longer than tibiae. Claws bent angularly, cleft subapically, tooth almost as long as claw. Genitalia as in figure 103.

SEXUAL DIMORPHISM: Hind tarsi longer in male, tibial spurs narrower; first segment of hind tarsi longer than in female, but shorter than longer of the spurs; pygidium more transverse in male. Clypeus in male more emarginate in front, more reflexed, and angles sharper than in female.

REMARKS: With its rough, coarsely punctured, rugose elytra, very long marginal hairs, dark club, and short elytra, this species should be readily identifiable. It might be confused with some individuals of *aenea* that have the pronotum not so finely punctured as in typical *aenea*, but the genitalia of the two species are distinct, and the tooth of the claws seems somewhat longer.

The series from the type locality and those from San Luis Potosi are, as is the lectotype, black, with slight greenish tinge, including the legs, and almost all have a shiny, impunctate spot on the pronotum; some have the front angles of the pronotum more acute than in the lectotype and the elytral marginal hairs longer—very long in fact. Some specimens have the second elytral interval quite irregularly unipunctate and the scutellum with many punctures. All the 18 specimens from Hidalgo ("*pachucana*") have the elytra tawny on the sides. The dorsal hairs are difficult to see but are visible at least at the apex and sides of the elytra. The long, thin, lateral

lobes of the male genitalia differ from those of both *clypeata* and *aenea*.

The type locality, Alvarez Mountains, has not been located. There is a place called Alvarez on the railroad southeast of the city of San Luis Potosi, but there are also other places in Colima and Guerrero with this name. It seems probable, however, that the locality is more northern than southern in view of the known range of the species. Dr. R. B. Selander (*in litt.*), who has come across beetles from the Alvarez Mountains in connection with his studies of *Epicauta* (Meloidae) taken by the same collector, Dr. Palmer, and reported in the "Biologia," tells me that all the localities he has found covered by Dr. Palmer have been in the more northern states of Mexico.

***Diplotaxis aenea* Blanchard**

Figures 19, 22, 105

Diplotaxis [*sic*] *aenea* BLANCHARD, 1850, vol. 1, p. 172 (Veracruz [Mexico]; type not found in Muséum d'Histoire Naturelle in Paris).

Liogenys pauperata BURMEISTER, 1855, p. 16 (Mexico; type, male, in Martin-Luther-Universität, Zoologisches Institut, Halle).

DIAGNOSIS: Minute hairs present on elytra, but seldom visible. Punctures of head, clypeus, and pronotum usually much finer than in *corrosa* and contrasting strongly with the large punctures of the elytra; marginal hairs shorter than in *corrosa*. Pronotum long as in *clypeata*, but without scale-like hairs on sides. When typical this species, with its long, finely punctured pronotum and greenish color, is readily identifiable.



FIG. 19. Distribution of *Diplotaxis aenea*.

RANGE: Most of Mexico except some of the most northern states and some of the most southern states. Reported by Fall (1909) from "Texas." Approximately 500 specimens have been examined. (See Appendix for locality data; see also fig. 19.)

HABITAT: About one hundred specimens from San Juan del Rio in Durango collected on the David Rockefeller Mexican expedition of 1947 are labeled "Catclaw diurnal," the diurnal being unusual for the genus, but apparently not unusual for this species. Four individuals from Silao, Guanajuato, were also taken in the daytime, by myself, as well as three from the state of Jalisco. At Guadalupe, Zacatecas, in June, 62 *aenea* were collected from the white flowers of a kind of morning-glory or were found mating in the leaves. At San Miguel Allende, Guanajuato, another 30 specimens were taken also in a white *Convolvulus*. P. D. Hurd, Jr., took an individual at San Juan del Rio on *Baccharis glutinosa*, presumably by day, and at Nombre de Dios, also in Durango, on *Asclepias*. The small eyes of this species may be a reflection of their diurnal habits.

DESCRIPTION: Color black or greenish black, sometimes bicolored (pronotum and scutellum black, elytra red). Length, 5 to 7 mm. Head with front abruptly declivous to clypeus, finely, densely punctured. Clypeal suture as in *corrosa*. Clypeus hairy, more than one-half of the length of head, punctures somewhat larger than those on head, sides either angulate in front of eye and slightly sinuate to front, or nearly straight, front margin deeply emarginate-angulate, margin broadly, steeply reflexed. Eyes, antennae, palpi, mandibles, labrum, and mentum as given for *corrosa*, but labrum here slightly concave and usually punctured.

Pronotum not appearing transverse, sides strongly arcuate behind middle, slightly sinuate to front angles which are right or acute, disc finely punctured as on head, but not quite so densely, often an impunctate longitudinal space at middle base. Scutellum with variable punctures. Elytra about twice longer than pronotum, usually appearing glabrous but actually with minute hairs in all punctures, punctures larger and deeper than those on pronotum, often confluent; second interval with one or two rows of punctures; costae

convex, with smaller punctures (suture with one row); marginal hairs moderately long.

Abdomen as in *corrosa*. Pygidium not large, densely punctured. Metasternum, front tibiae, middle and hind tarsi as in *corrosa*. Claws as in *corrosa*, but tooth shorter than claw. Genitalia as in figure 105.

SEXUAL DIMORPHISM: Hind tarsi in male longer than hind tibiae by length of entire claw segment; shorter in female. The rest as in *corrosa*, except that hind tibia in male is slightly bent back at apex and has scarcely any apical flare.

REMARKS: This species, one of the smallest in the genus, probably occurs in more states of Mexico than any other species except perhaps one or two species of the *trapezifera* group. It has been taken in some of the same states (Hidalgo, Guanajuato) as the equally small *corrosa*, and in Oaxaca with *clypeata*. Although Veracruz is the type locality, I have seen no specimens from that state. All the other localities are in the highlands. Fall (1909), however, reports three specimens from "Texas" that he had seen at the United States National Museum, but I question these because no specimens have been reported from the east coast of Mexico between Veracruz and Texas, and all the Mexican specimens I have seen have come from south of latitude 26° N. Some of Bates's records for this species are also probably erroneous, because I have examined the specimens he mentions in the "Biologia" (1887-1888, p. 158) from Cordoba, Veracruz; Capulalpam in Oaxaca; and Tepetlapa, Amula, and Mescala in Guerrero, and they are not *aenea*.

The green sheen characteristic of *aenea* and the other species of the group is not always very evident and in certain lights or angles appears black. The individuals that are bicolored have red or red-brown elytra and scutellum, with the pronotum black or green. The following specimens are similarly bicolored:

Atlixco, Puebla: 6 of 19
 Puebla, Puebla: 5 of 11 (1 with pronotum brown and elytra black)
 Chipilo, Puebla: 1 of 2
 Huahuapan, Oaxaca: 1 of 1
 Jacona, Michoacan: 1 of 1
 Cuernavaca, Morelos: 1 of 1
 Silao, Guanajuato: 2 of 4
 San Miguel Allende, Guanajuato: 4 of 29

San Juan del Rio, Durango: 6 of 100
 San Lucas, Durango: 3 of 15
 Gonzalez, Guanajuato: 8 of 8

In many others the apex of the elytra may be reddish brown; the legs are usually reddish, with the femora often dark, but may be entirely dark.

This species, when typical, shows a marked contrast between the fine, dense, uniform punctures of the long pronotum and the much larger, rugose, confluent punctures of the elytra, but individuals vary, and some specimens tend to resemble *corrosa* if they have the pronotal punctures larger than usual. The pronotum is less transverse than in most members of the genus. The clypeus (fig. 22) is usually long and strongly reflexed, with the front border emarginate and with prominent angles, but at times scarcely reflexed and with the angles more rounded. The antennal club is much longer than in many species, being almost as long as the radius of the eye. The lobes of the male genitalia are about as in *clypeata* but proportionately longer, and the eighth sternite is truncate at apex, not acuminate. The genitalia of *corrosa* are still longer than those of *aenea* and are different in shape (figs. 103, 105).

Liogenys pauperata Burmeister was synonymized with *aenea* by Burmeister himself (1855, p. 264). Burmeister had also placed *pilifera* in *Liogenys* instead of in *Diplotaxis*. I have examined Burmeister's types. His male is the same as *aenea*, but his female of *pauperata* is a hairy species described later by Bates as *coriacea*. Burmeister (1855, p. 16), however, does not mention any dorsal hairs.

Diplotaxis clypeata Bates

Figures 22, 105

Diplotaxis clypeata BATES, 1887 (1887-1888), p. 157, pl. 9 (Yolos, [Oaxaca], Mexico; lectotype, male, designated by me from original specimens in British Museum).

Diplotaxis albosetosa MOSER, 1921, p. 180 (Sierra Mixteca, [Oaxaca], Mexico; type, male, represented by genitalia only, and paratype, female, in Zoologisches Museum, Berlin). New synonymy.

DIAGNOSIS: Broad, scale-like, white hairs present on sides of pronotum and in punctures of intervals, but not striae, of elytra; vestiture ventrally consisting of fine hairs.

This species has the long greenish pronotum of *aenea* and the strong, but denser and smaller, punctures of *corrosa*, the long marginal hairs of *corrosa*, but the clypeus (fig. 22) more advanced and quadrate in the male than in either of the other species of the group. Differs from both in the scaly white pubescence.

RANGE: Northwestern Oaxaca in southern Mexico. Sixteen specimens have been examined as follows: Oaxaca: Sierra Mixteca [Sierra de las Mixtecas], one male (type of *albosetosa*, but genitalia only), one female (the paratype of *albosetosa*), and six other specimens; Yolox [Yolox], two males (including the lectotype of *clypeata*), one female; Tamaulapan, June, 1956, one male, four females.

DESCRIPTION OF LECTOTYPE, MALE: Color black, with greenish sheen on head, pronotum, and femora, dark red on elytra, reddish on tibiae. Length, 6.5 mm. Head and clypeus with short, white, slanting hairs and clypeal suture not thickened, head rugosely densely punctured, front sloping obliquely to clypeus. Clypeus almost as long as head but with larger punctures, side margins scarcely indented, front margin as in *corrosa*. Eyes, antennae, palpi, mandibles, labrum, and mentum as in *corrosa*.

Pronotum not appearing transverse, with slanting, white, scale-like hairs most noticeable on sides, sides arcuate at middle, front and hind angles obtuse, punctures dense, rugose, base at sides with narrow impunctate area. Scutellum densely punctured, most of the scale-like hairs worn off. Elytra with white, slanting, scale-like hairs in punctures of intervals, but not of striae, each hair about as long as distance between punctures, the latter being dense, rugose, as on pronotum; second interval more or less unipunctate, costae rather indistinct, but convex, and with smaller, sparser punctures than on intervals; marginal hairs white, about twice as long as those on dorsum.

Abdomen, pygidium as in *corrosa*. Metasternum normally long. Front tibiae with basal tooth situated near middle, but subobsolete. Middle and hind tarsi and claws as in *corrosa*. Genitalia as in figure 105. Ventral surface with long, white, fine hairs, not scale-like hairs.

SEXUAL DIMORPHISM: Male with sharper, more advanced front angles on clypeus and

narrower hind tibial spurs than female. In one of the females, the pygidium and length of the fifth ventral segment appear to be the same as in the males.

REMARKS: This species, because of its thick scaly vestiture and advanced clypeus, was at first considered by me as belonging with the *pilifera* group. It actually differs, however, from the species of that group in many details, such as the smaller, more widely spaced eyes, the dark antennal club, the lack of pubescence on the striae of the elytra, the small pygidium, and, in the male, longer, thinner, tarsal segments without thick hairy pads below, and the proportionately smaller genitalia, with the apices straight, not curved downward. Bates (1887-1888), although he placed *clypeata* next to *pilifera*, was aware of the differences, mentioning especially the length of the tarsal segments and the different clothing of the soles of the tarsi of the male. He followed the descriptions of *pilifera* and *clypeata* by those of *aenea*, *cribraticollis*, and *trapezifera*, thus showing how similar he considered all of these to be.

The rigid abdominal setae on the middle of each ventral segment that Bates thought characteristic of the male of *clypeata* are also visible in the female, and are in fact present in other species, although they may be so fine as to pass unnoticed. The sixth ventral segment is somewhat conspicuous in a second specimen from Yolox, but not in the lectotype, or in the paratype of "*albosetosa*." This other Yolox male has the tibiae and elytra darker than the lectotype; the females from Yolox and Sierra Mixteca have the elytra and all the legs tawny and the elytral scales longer than the lectotype. The male from Tamaulapan has dark elytra and red legs; a number of males from Mixteca have a brownish tinge to the elytra. The lateral lobes of the male genitalia are more as in *aenea* than as in *corrosa*.

Moser's *albosetosa* (Sierra Mixteca) appears to be a synonym of *clypeata*, not only according to the description, but according to the female paratype (all that remains of the type are the male genitalia which are mounted on a card). The strongly elevated front margin of the clypeus, dark antennae, obtuse front angles of the pronotum, and white scaly vestiture sufficiently characterize this form as

clypeata. The genitalia, although twisted on the type, are similar to those of the lectotype of *clypeata*. The female paratype resembles in color the brown variety of *corrosa*.

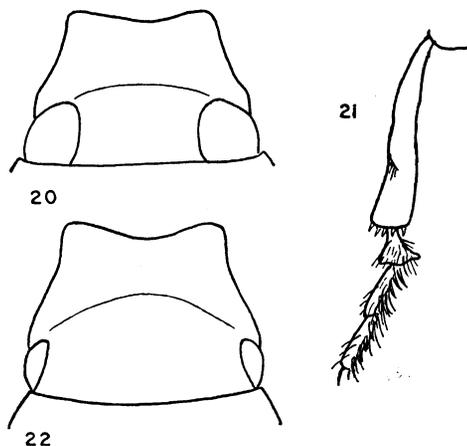
Some variations from the above description of the lectotype are that some individuals may be slightly larger; the marginal hairs may be three times longer than those on the dorsum; the dorsal hairs may be less scaly but are always white; the clypeus of the male may be shorter (one-half of the length of the head) and less reflexed. Two at least of the specimens from Tamazulapan have the front angles of the pronotum acute.

The type locality (Yolos) does not appear on the map of Hispanic America (American Geographical Society, 1945), but in the "Biologia Centrali-Americana" (vol. 4, pt. 4) it is given a few times as "Yolos in Oaxaca" (also in vol. 4, pt. 2, p. 452). According to the United States Board of Geographic Names (no. 15), there is a Yolox, which would be pronounced in the same way as Yolox, northwest of the city of Oaxaca at a latitude and longitude ($17^{\circ} 37' N.$, $97^{\circ} 31' W.$) that would place it in the Sierra de las Mixtecas, the locality from which Moser's *albasetosa* was taken. Tamazulapan, where Bernard Rotger took five specimens, is in these same mountains.

SPECIES GROUP *pilifera*

Two species are included in this group: *Diplotaxis pilifera* Burmeister, and *hallei*, new species.

This is an unusual group of small species (6 to 8 mm.) from central and southern Mexico with some similarities to the species of the following group (*puberea*), both *puberea* itself and *pilifera* having been originally described in the genus *Liogenys*. In both groups the pygidium is very large, the sixth ventral segment is rather long and usually exserted, the abdomen of the male is quite concave, and the males have larger front tarsi than the females, also hairy pads on the tarsi (females also in *puberea* group). In the *pilifera* group, the species are characterized by (and in these characters differ from the *puberea* group) small size, very large eyes, the presence of broad, white (not yellow), scale-like, depressed hairs above and below, "*corpore recumbenti-cinereo-setoso*" (Bates, 1887-1888, p.



FIGS. 20-22. Parts of some *Diplotaxis*. 20. Head and clypeus, *D. hallei* and *D. pilifera*. 21. Right middle tibiae and tarsi of male of *D. pilifera*, showing short-spined first segment. 22. Head and clypeus of *D. clypeata*, showing small eyes; characteristic also of *D. aenea*.

157), an advanced, almost quadrate, rather scooped-out clypeus (fig. 20), acute and drawn forward front angles of the pronotum, and bristles within the internal sac of the male genitalia. No other species has been found with all these characters, but there are species with one or more of them. Another species with thick scaly vestiture is *mus* Fall from farther north, which has an entirely different clypeus (fig. 96) and labrum; another also is *clypeata* Bates from Oaxaca which has very small eyes, dark antennal club, and small pygidium. A species from Guatemala (*cavifrons* Moser) sometimes has the hairs on the pronotum rather scale-like, but it has the sides of the abdomen ridged and the front of the head excavated.

About 90 specimens have been examined, including the type of *pilifera* Burmeister and also all the specimens of *pilifera* mentioned in the "Biologia."

All the characters are given under the description of *hallei* with which *pilifera* is there compared.

Diplotaxis hallei Vaurie, new species

Figures 20, 23, 87, 104

TYPE MATERIAL: Type, male, Puente de Ixtla, Morelos, Mexico, 3500 feet, June, H. H. Smith, collector, deposited in the American Museum of Natural History. Twenty-four

paratypes as follows: one male, same data; also 10 males, three females, from same locality but collected July 4, 1900, by C. C. Deam; six males, one female, Kilometer 187, near Iguala, Guerrero, June 6, 1955 (R. B. and J. M. Selander); one male, one female, 12 miles south of Tzitzio on Huetamo Road, Michoacan, 19° 20' N., 100° 50' W., July 10, 1947, 1050 meters (T. H. Hubbell); one male from Real de Arriba, Temascaltepec, state of Mexico. Paratypes in the collections of the American Museum of Natural History, California Academy of Sciences, United States National Museum, University of Michigan, and R. B. Selander.

DIAGNOSIS: Broad, short, scaly hairs in all punctures. This species could be confused

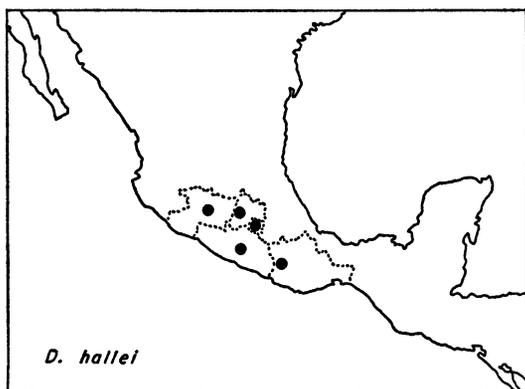


FIG. 23. Distribution of *Diplotaxis hallei*.

only with *pilifera* or *clypeata*. It is dorsally not distinguishable from the former, but the male genitalia and the secondary sexual characters differ (see under *pilifera*). From *clypeata* (*aenea* group) it differs notably in the large eyes and large pygidium, and by having pubescence in all the elytral punctures.

RANGE: The highlands of central Mexico from Michoacan, Morelos, and Mexico state south into Guerrero and Oaxaca. (See fig. 23.) Twenty-one specimens have been examined in addition to the paratypes (see below).

DESCRIPTION OF TYPE, MALE: Length, 8 mm. Head and abdomen black, the rest red-brown, the appressed, scale-like, white hairs broader ventrally than dorsally. Head densely rugosely punctured, front sloping obliquely to clypeus, clypeal suture slightly thickened. Clypeus almost as long as head, punctured as

on head, nearly quadrate in shape, front margin slightly emarginate, broadly reflexed, scooped out, the angles forming blunt right angles (fig. 20), side margins indented in front of eye, thence nearly straight and parallel to front. Eyes large, each one-quarter of the width of head. Antennae 10-segmented, club at least as long as funicle, pale in color. Maxillary palpi with last segment impressed dorsally. Mandibles small. Labrum concave at center, sides prominent; scarcely arcuate in front, very short, about one-half of the length of reflexed under side of clypeus. Mentum rather flat, with slight declivity at anterior fourth, posteriorly nearly straight, margined, and pubescent.

Pronotum with hairs denser laterally, sides very strongly arcuate behind middle, thence narrowing and sinuate to acute front angles, hind angles rounded off; punctures dense, rugose; base punctured. Scutellum densely punctured. Elytra with hairs in all punctures, each hair slightly overlapping the next; punctures dense, rugose, larger than those on pronotum; second interval with more or less single row of punctures but confused by confluence of punctures; costae convex and with smaller sparser punctures, but costae indistinct; marginal hairs white, as short as those on dorsum. Metasternum narrowly depressed at center.

Abdomen black, not ridged laterally, fifth segment without groove above pygidium, sixth segment prominent, large. Pygidium very large, densely punctured. Front tibiae appearing bidentate, because third or basal tooth, which is submedian, is obsolete, only barely indicated. Middle tarsi with first two segments nearly equal in length, hind tarsi with first segment about half of the length of second. Claws angularly bent, cleft subapically, tooth almost as long as claw. Genitalia as in figure 104.

SEXUAL DIMORPHISM: Clypeus of male with sharper lateral angles and more deeply indented front margin. Male tarsi equipped with hairy pads below; front tarsi larger than in female. Male with pygidium more transverse, less pointed than in female, and hind femora more slender.

REMARKS: Ever since the publication of the "Biologia," for which Bates identified specimens from Iguala, Guerrero, and Puente

de Ixtla, Morelos, as *pilifera* Burmeister, this new species, *hallei*, has been called *pilifera* in most collections. I have now had the opportunity, thanks to Dr. Husing of the Martin-Luther-Universität at Halle, of examining the type of *pilifera* (type locality, Mexico). I find that it is not the same as the specimens from Guerrero and Morelos, as believed, but it is the same as some specimens from the state of Colima, Mexico, that I was prepared to describe as a new species. These specimens from Colima have some unusual secondary sexual characters that were not mentioned by Burmeister (see *pilifera*), and it is only by these characters and the genitalia of the male that *hallei* and *pilifera* can be differentiated. Dorsally, there seem to be no distinguishing characters between the two species. Therefore it is no wonder that these species have long been considered as one, especially because the more unusual *pilifera* is the less common and seemingly the more restricted geographically. All but one of the 15 "Biologia" specimens in the British Museum are *hallei*, not *pilifera*, including the specimen of "*pilifera*" figured on plate 9.

In addition to the external differences between the species given in the diagnosis of *pilifera*, the male genitalia (dissected from nine or 10 *hallei* and from six *pilifera*) differ in the shape of the lateral lobes (figs. 104, 107); the lobes are joined nearer the base and are proportionately much smaller in *hallei*; the stiff brush of hairs in the internal sac is larger in *hallei*, and placed differently; and the eighth sternite is much smaller, and not rounded apically (figs. 86, 87).

The length of the paratypes ranges from 6.5 to 8 mm. Some of these specimens have a basal impressed line on the pronotum as in *pilifera*; the scutellum is covered with scale-like hairs except when worn; and the elytral costae are occasionally more distinct than in the type specimen.

A number of additional specimens, not paratypes, have been examined from the type locality, as well as from Tejupilco and Bejucos in the state of Mexico, and from Tepetlapa in Oaxaca [the latter locality is given in the "Biologia" as being in Guerrero, but according to the map of Hispanic America (American Geographical Society, 1945) it is across the state border in Oaxaca].

The species is named in honor of the city in which Burmeister's types of the genus are kept, and it is only through my seeing these types that the question of which specimens are really *pilifera* has been solved.

***Diplotaxis pilifera* Burmeister**

Figures 21, 86, 106, 107

Liogenys pilifera BURMEISTER, 1855, p. 16 (Mexico, here restricted to the state of Colima in western Mexico; type, male, in Martin-Luther-Universität, Zoologisches Institut, Halle).

DIAGNOSIS: Broad, short, scaly hairs in all punctures. The female differs from females of *hallei* by having the pygidium deeply, abruptly concave, not flat or convex, and the male differs by having the two usual spurs at the apex of the middle tibiae so short that they are lost among the apical spines, by having the first segment of the middle tarsi only one-half of the length of the second, not subequal, and this segment widened apically and spined on the inner side (fig. 21). In both sexes the sixth ventral segment is even longer than in *hallei*.

RANGE: Colima and western Michoacan in southwestern Mexico. Forty-nine specimens have been examined from Mexico. *Colima:* Ten miles west and 12 miles east of Colima, July, 1953, August, 1954, 10 males, 32 females; Colima and "Vulcano," Colima, three males, two females. *Michoacan:* Apatzingan, 400 meters, July, 1947, one female. One old specimen, a female, from "Californ," which is probably an error, or else it does not refer to present-day California; it might conceivably be Baja California.

HABITAT: Forty specimens from 10 miles west of Colima were collected at night by M. Cazier, W. Gertsch, and Mr. and Mrs. Bradt at the lights of a service station; another specimen near Colima was taken from vegetation at night.

DESCRIPTION: Length, 6 to 8 mm. Color, hairs, clypeus, eyes, antennae, palpi, mandibles, labrum, mentum as in *hallei*, but labrum only one-third of the length of the under side of clypeus. Pronotum as in *hallei*, but also with a narrow impunctate area along base. Scutellum, elytra, metasternum, abdomen, pygidium, sixth ventral segment, front tibiae, hind tarsi, and claws as in *hallei*. Genitalia as in figures 106, 107.

SEXUAL DIMORPHISM: The male has the first segment of middle and hind tarsi no longer than wide and only one-half of the length of second, the first segment of middle tarsi also apically widened and with a spiny projection on inner apex, partly hidden by hairs; in the female the first segment of middle tarsi is long and slender. The male has first three or four tarsal segments thickly padded with yellow hairs; females have less abundant hairs. Male with hind tibiae, seen from outer edge, not straight as in female, but slightly bent inward, the apical spurs very unequal, smaller one only one-third of the length of longer one. Apical spurs on middle tibiae of males are no longer than the apical ring of spines and are scarcely visible. Angles of clypeus sharper in male, more rounded in female. Females with the pygidium more pointed apically than male and with the entire disc deeply concave as if it had been pushed in by mechanical means. Male with larger front tarsi.

REMARKS: This species was described by Burmeister as a *Liogenys* because of the sexual differences in the tarsi, but it is known now that a number of *Diplo-taxis* (*puberea*, *moerens* groups) have larger or more hairy front tarsi in the male sex. Burmeister does not mention the sixth ventral segment which is very prominent, almost as much so as in *Liogenys*, but this character also is present in other *Diplo-taxis* (*moerens*, *brevidens* groups).

As stated under *hallei*, specimens of that species have long been misidentified as *pilifera* because of their great dorsal similarity. Only one of the many specimens identified and discussed by Bates in the "Biologia" as *pilifera* is actually that species, and unfortunately it has no further locality than "Mexico." The type also has no actual locality, but all the specimens I have seen are from Colima and western Michoacan.

The concavity of the pygidium in the female is apparently a unique character in the genus and a very unusual one. The entire disc appears to have been pushed in as if by a blow. This must certainly have been noticed by other workers, but was probably thought to be the result of a mechanical injury, a quite understandable assumption with the small amount of material available in the past from Colima. With the present series of 34 females,

however, the character is found to be constant and unmistakable. Some examples of Bates's *laevivertex* from Guerrero have the pygidium broadly bicallose so that there is a median sulcus, but this is quite different from the round depression here.

The extreme shortness of the first tarsal segments on the middle and hind legs of the male and the nearly obsolete apical spurs of the middle tibiae of the male are other characters not found elsewhere in the genus, although the first tarsal segment on the hind legs is quite short also in *hallei* and *laevivertex*. The spined first tarsal segment (fig. 21) occurs with slight modification in three of the larger Mexican species, *spina*, and two undescribed species. There seems little point, however, in creating a genus for this species, first, because all the unusual characters are only sexual, and, second, because the species is otherwise scarcely distinguishable from *hallei*. Bates (1887-1888, p. 157), in discussing *clypeata* (*aenea* group) and *pilifera*, found them "opposed to the typical forms of *Diplo-taxis*" but not generically distinct, and he thought that abrupt variations must have been at work to allow species so closely allied in some respects to differ so strongly in other respects.

The black or piceous head and abdomen are present in most specimens, with the exception of four or five females that have these parts only faintly darkened. Sometimes the head or clypeus has a greenish tinge, as occurs also in *hallei*. Both the clypeus (shape and angles) and the hairiness of the tarsi are more exaggerated than in *hallei*.

The range of this species is different from and more restricted than that of *hallei*, but both species have been taken in the state of Michoacan, *hallei* in the north near Morelia and *pilifera* farther west, about midway between Morelia and the state of Colima on the Pacific coast.

SPECIES GROUP *puberea*

The following species are included in this group: *Diplo-taxis tarsalis* Schaeffer; *bowditchi* Fall; *puberea* Bates; *brevipilosa* Moser; *micro-tichia* Moser; *simillima* Moser; *spina*, new species; *jacala*, new species; *pubipes* Schaeffer; and *maya*, new species.

This is a group of medium-sized to large

species (from about 9 to 13 mm.) with abundantly hairy tarsal pads on all legs and in both sexes, and long, straight, narrow, hind femora and tibiae in the males. Three of the species (*tarsalis*, *pubipes*, and *maya*) are glabrous dorsally; the remainder are pubescent. The species are rather similar in appearance, with the same general type of large pronotum, densely punctured elytra, with rather flat costae, quite similar labrum, mentum, eyes, antennae; most of the species show definite sexual dimorphism. (See table 1.) Five of the hairy species (*bowditchi*, *puberea*, *brevipilosa*, *microtichia*, *simillima*) can scarcely be differentiated from one another if only females are available. These species are discussed further under *bowditchi*.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Head with front evenly rounded to clypeus, clypeal suture usually obliterated at middle by punctures or rugae, but is distinct in some individuals. Eyes moderate in size, each comprising from about one-fourth to one-fifth of the width of head, as seen from above. Antennae 10-segmented,

club about as long as funicular segments combined. Maxillary palpi with last segment impressed or flattened at base dorsally. Mandibles (when closed) as long as labrum, but narrow. Pronotum less than twice as wide as long, widest part at middle. Elytra with second interval multipunctate, marginal hairs short, not or scarcely longer than sutural interval is wide. Abdomen not ridged laterally, but rather strongly keeled in some individuals of *bowditchi* and *puberea*. Tarsi with first four segments furnished below with thick pads of golden hairs dense enough to conceal surface of segments; first segment of middle tarsi longer than second, often markedly so. Front tibiae tridentate. Claws, except as stated for some males, bent abruptly, cleft subapically, the tooth wider than claw and often about as long (fig. 7).

SEXUAL DIMORPHISM: Males with hind tarsi longer than hind tibiae, females with them the same length or slightly shorter. Males with narrow, nearly straight hind tibiae, not flared out at apex. First tarsal segment on hind tarsi longer in males than the longer of the two tibial spurs (usually one-

TABLE 1
SOME SPECIFIC DIFFERENCES AMONG MALES OF THE *puberea* GROUP OF *Diplotaxis*

Species	Dorsal Surface	Front Clypeal Angles ^a	Genitalia	Last Palpal Segment ^b	Front Inner Claws ^c	Front Tarsal Segments ^d
<i>tarsalis</i>	Glabrous	Dentiform	Figure 109	Widely dilated	Normal	Normal
<i>bowditchi</i>	Pubescent	Dentiform	Figure 108	Widely dilated	Tooth rounded, often expanded	Normal
<i>puberea</i>	Pubescent	Dentiform	Figure 115	Dilated	Tooth as <i>bowditchi</i> , or sinuate behind, or claws elongate	Normal
<i>brevipilosa</i>	Pubescent	Dentiform	Figure 108	Dilated	Elongate, scarcely cleft	Dilated
<i>microtichia</i>	Pubescent	Dentiform	Figure 113	Normal	Tooth rounded, often expanded, or claws elongate	Widely dilated
<i>simillima</i>	Pubescent	Dentiform	Figure 114	Normal	Tooth rounded, often expanded	Widely dilated
<i>spina</i> ^e	Pubescent	Dentiform	Figure 110	Dilated	Normal	Normal
<i>jacala</i>	Pubescent	Rounded	Figure 111	Normal	Normal	Normal
<i>pubipes</i>	Glabrous	Rounded	Figure 111	Normal	Normal	Normal
<i>maya</i>	Glabrous	Dentiform	Figure 111	Dilated	Normal	Normal

^a Dentiform angles are often worn down and appear obtuse or subacute.

^b For "widely dilated," see figure 24; "dilated," figure 25; "normal," figure 26, or same as in females.

^c See figures 38-40.

^d "Normal" means not wider than tarsi on other legs; "dilated" means slightly wider; "very dilated" means three or four times wider.

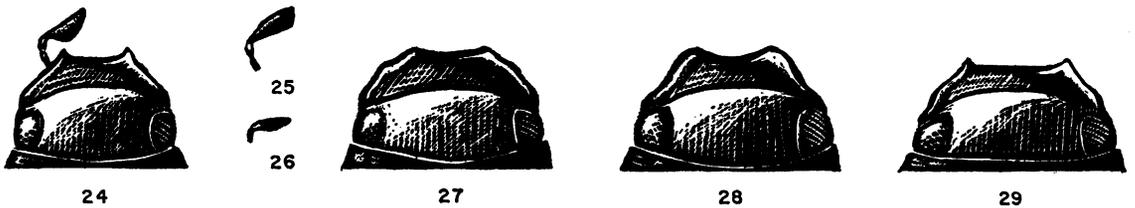
^e The only species in which the male has the first segment of the middle tarsi spined at inner apex.

third to one-half longer), in females same length or slightly shorter. Hind tibial spurs and hind femora usually narrower in males than in females. Pygidium usually more transverse in males and fifth abdominal segment in males shorter, about one-half or nearly one-half of length of third, in females this segment nearly as long as third segment. Additional characters of males are given in table 1.

KEY TO THE SPECIES OF THE *puberea* GROUP¹

1. Glabrous dorsally 2
Pubescent dorsally, hairs present in most dorsal punctures 4
2. Pronotal hind angles broadly impressed or at least concave within; clypeal angles usually acute, dentiform (fig. 24), occa-

- margin usually truncate or but slightly emarginate; not occurring in Hidalgo . . . 5
5. Male with first tarsal segment of middle legs prolonged at apex on inner side into spiny projection (fig. 33); both sexes with basal tooth of front tibiae farther from the two apical teeth than these are from each other, and nearer middle of tibiae (fig. 36); Oaxaca *spina*
Male without prolongation of middle tarsal segment; both sexes usually with teeth of front tibiae nearly equidistant and all situated well in front of middle (as in fig. 37 of *jacala*) (this character somewhat variable) 6
6. Male, front tarsi widely dilated, their second segment (seen from above) not more than twice longer than wide and three or four times wider than apical part of either the



FIGS. 24-29. Head, clypeus, and palpi of the *puberea* group of *Diploptaxis*. 24. *D. tarsalis*, male, showing enlarged terminal segment. 25. Palpal segment of *D. spina*, male. 26. Palpal segment of *D. bowditchi*, female. 27. *D. maya*. 28. *D. jacala*. 29. *D. spina*. (Hairs not shown.)

- sionally merely obtuse; scutellum of usual size (fig. 32); Arizona south to Jalisco and Mexico state *tarsalis*
- Pronotal hind angles convex, not at all impressed; clypeal angles either broadly rounded or subacute; scutellum very small, half or less than half of normal size (fig. 31) 3
3. Clypeal angles broadly rounded (as in fig. 28 of *jacala*); sides of clypeus indented abruptly or at least strongly bent inward in front of eyes (as in fig. 44 of *zeteki*); Texas to Veracruz *pubipes*
Clypeal angles subacute (fig. 27) or dentiform (figs. 24, 29); sides of clypeus straight or slightly sinuate, not indented or bent inward; Yucatan, Chiapas, and northern Guatemala *maya*
- 4(1). Clypeus with front angles broadly rounded, its front margin usually distinctly emarginate (fig. 28); Hidalgo *jacala*
Clypeus with front angles dentiform (as in figs. 24, 29), or subacute (fig. 27), its front

- claw segment or of first segment of middle tarsi 7
- Male, front tarsi only slightly dilated, second segment (seen from above) three times longer than wide and scarcely wider than apical part of claw segment or of first segment of middle tarsi 9
7. Male, genitalia long, narrowing to apex (fig. 108), the lateral lobes joined at basal sixth or seventh, last segment of maxillary palpi slightly or strongly dilated (figs. 24, 25); both sexes finely, densely punctured dorsally; surface often alutaceous; Guatemala *brevipilosa* (in part)
Male, genitalia short, stout, same width up to apex (figs. 113, 114), lateral lobes joined at basal fourth or fifth, last segment of maxillary palpi narrow as in female, and not dilated (fig. 26); both sexes coarsely and densely punctured, sometimes sparsely punctured; surface shining; both coasts of southern Mexico 8
8. Male, genitalia as in figure 114; center space between lobes wider than either lobe; front tarsi not quite so dilated as in *microtichia*; Nayarit, also Morelos and

¹ For identification of males, see sexual dimorphism, above, and table 1.

- northern Guerrero *simillima*
- Male, genitalia as in figure 113, center space between lobes usually narrower than either lobe; front tarsi more dilated than above; Veracruz, Oaxaca (probably in northern part), possibly eastern Puebla *microtichia*
- 9(6). Male, inner front claws very long, virtually straight, cleft shallowly just behind apex (fig. 40) 10
- Male, inner front claws no longer than middle claws, curved (fig. 38), sometimes sinuate (fig. 39) 11
- 10. Male, genitalia long, narrow, tapering, not wider at apex (fig. 108); Guatemala *brevipilosa* (in part)
- Male, genitalia short, widened into "head" apically (fig. 115); Mexico *puberea* (in part)
- 11. Male, genitalia (fig. 108) as long as middle tibiae, lobes joined in about basal fourth; maxillary palpi with last segment widely, sharply, triangularly dilated (as in fig. 24); southwestern Durango and northern Michoacan *bowditchi*
- Male, genitalia (fig. 115) shorter than middle tibiae, lobes joined about basal sixth or eighth; maxillary palpi with last segment slightly, if at all, dilated (as in figs. 25, 26); northern Michoacan south to southern Guerrero, Oaxaca, and Chiapas, Veracruz (?) *puberea* (in part)

DISCUSSION: The 10 species of this group may be recognized by a combination of the following characters: 1. Thick pads of golden hairs on the soles of the first four tarsal segments in both sexes, the hairs a little denser and longer in males, but always sufficiently dense even in females to conceal the under surface of the tarsi. 2. Long and narrow first segment of the middle tarsi in both sexes (definitely longer than second segment). 3. Long first segment of hind tarsi in male (longer than second, but not so much longer as on middle tarsi). 4. Tiny denticulations on base of pronotum except at middle, the denticulations readily discernible at X18 power in most species, often obsolete or replaced by broad scallops in *puberea*, *spina*, *microtichia*, and *simillima*. When the base of the pronotum is applied closely to the elytra, the denticles are usually hidden; they are best seen by tipping forward the specimen. This character is present in other species of the genus but not so noticeably. 5. Modification of un-

equal tooth of front inner claws in males of some species wherein tooth is expanded, or rounded, or seemingly fused with claw. 6. Elongation of front inner claws in some males. 7. Front tarsi in males of some species markedly enlarged, longer and more dilated than in females or than the tarsi on other legs. 8. Last segment of maxillary palpi in males of some species triangularly dilated on inner side and much larger than the elongate, oval-shaped palpi of the female. 9. A slight or strong depression is present at base of pronotum just in front of scutellum.

The glabrous species of the group actually have minute hairs in the elytral punctures, as is true of many of the so-called glabrous species of the genus. The hairs in the pubescent species are very fine and short, not visible to the unaided eye, depressed. They are present in all the punctures.

The male genitalia of *jacala*, *pubipes*, and *maya* are virtually similar; those of *spina* are more pointed and more deflexed at apex; those of *tarsalis* and all the others of the group are variations on the same general pattern. (See table 2.)

The enlargement of the male palpi and front tarsal segments, and the hairy tarsal pads are characters common also to many species of the genus *Liogenys* (South America to Panama and ?Mexico), *puberea*, in fact, having been described in that genus. All the species of *Liogenys* I have seen that possess enlarged front tarsi have, however, the middle tarsi also enlarged, which is not true in *Diplotaxis*. See Introduction for discussion of genera.

This is a group of predominantly Mexican species; only two of the species occur as far north as Arizona and Texas (*tarsalis*, *pubipes*), and two (*maya*, *brevipilosa*) reach as far south as Guatemala. With additional collecting, however, it is likely that some of the other Mexican species will be found to occur south of Mexico. *Bowditchi*, *tarsalis*, and *pubipes* have not been recorded previously from Mexico, *bowditchi* having been erroneously described from the United States.

There are many other species in the genus with hairy tarsal pads, but most of these have pads in the male only, as in the small (7 to 8 mm.) *brevisetosa* and *dubia* from Texas, or *pilifera* and *hallei* from southern Mexico, or

TABLE 2
COMPARISON OF LATERAL LOBES OF MALE GENITALIA OF SOME SPECIES OF
THE *puberea* GROUP OF *Diplotaxis*^a

<i>bowditchi</i>	<i>puberea</i>	<i>brevipilosa</i>	<i>microtichia</i> and <i>simillima</i> ^b
Long, narrow, tapering; joined basal fourth or less; dorsally concave from basal joint to apex; lateral groove present; lobes longer than basal piece	Short, rather tapering, but each lobe with expanded "head"; joined basal sixth or eighth; dorsally a little higher at basal joint; deep lateral groove present; lobes and basal piece equal in length	Long, narrow, tapering; joined basal sixth or seventh; dorsally flat; deep lateral groove present (no comparison made with basal piece)	Short, stout, same width throughout or wider at apex; joined basal fourth or fifth; dorsally flat; no noticeable lateral groove present; lobes and basal piece equal in length

^a Based on dissections of 15 males of *bowditchi*, 12 of *puberea*, two of *brevipilosa*, 13 of *microtichia*, and nine of *simillima*.

^b These two species differ in the amount of space between the lobes.

ambigua from Arizona and northern Mexico, and perhaps others. The male of *anthracina* from Baja California has pads on the first two segments, but this species is readily distinguished in the male by having the inner claw on the front tarsi almost twice as big as the outer. There are also species in which males have very hairy tarsi, but not truly hairy pads because the surface can be seen through the hairs. These include small species, such as *bidentata* from the eastern United States, *juquilensis* and *laevivertex* from southern Mexico, *thoracica* from Texas, which is slightly larger, a few species of the *trapezifera* group (clypeus hairy, but not the rest of dorsum), *zeteki* from Panama, and others not yet described.

Approximately 500 specimens of this group have been examined, more than half of which belong in the species *tarsalis*. The types of *bowditchi* Fall, *puberea* Bates, and of *mexicana*, *brevipilosa*, *microtichia*, and *simillima* Moser have been examined. The material from Mexico was collected by members of three expeditions, the Martin-Robbins expedition of 1949, and two David Rockefeller expeditions of the American Museum of Natural History, in 1947 (Bradt, Cazier, Gertsch, Michener, Schrammel, and Spieth, collectors), and in 1953 (C. and P. Vaurie, collectors), and by many individuals.

In the formal descriptions the two glabrous species (*pubipes* and *maya*) are for convenience compared with the glabrous *tarsalis*,

and the hairy ones with the hairy *bowditchi*, even though the glabrous species are not, in my opinion, so closely related.

Diplotaxis tarsalis Schaeffer

Figures 24, 30, 32, 34, 35, 109

Diplotaxis tarsalis SCHAEFFER, 1907, p. 64 (Huachuca Mountains, Arizona; type, male, in United States National Museum).

Diplotaxis mexicana MOSER, 1918, p. 305 (Durango, Mexico; type, male, in Zoologisches Museum, Berlin). New synonymy.

DIAGNOSIS: Small to medium-sized, light or dark red, glabrous dorsally. Distinguished from all others in the group by the broadly impressed hind angles of the pronotum and differing further from the two other glabrous species (*pubipes* and *maya*) by having the last palpal segment of the male dilated and the scutellum normal in size, not tiny.

RANGE: From Hidalgo and Mexico in central Mexico north and west on the plateau through Jalisco, Durango, and Chihuahua into the mountains of southern Arizona. Over 300 specimens have been examined. (See Appendix for further data; also fig. 30.)

HABITAT: In Arizona, specimens from Madera Canyon were collected in an oak-pine-juniper zone; one specimen from Pinery Canyon in the Chiricahua Mountains was taken on *Quercus arizonica* in August.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 9 to 11 mm. (one specimen, 7 mm.).

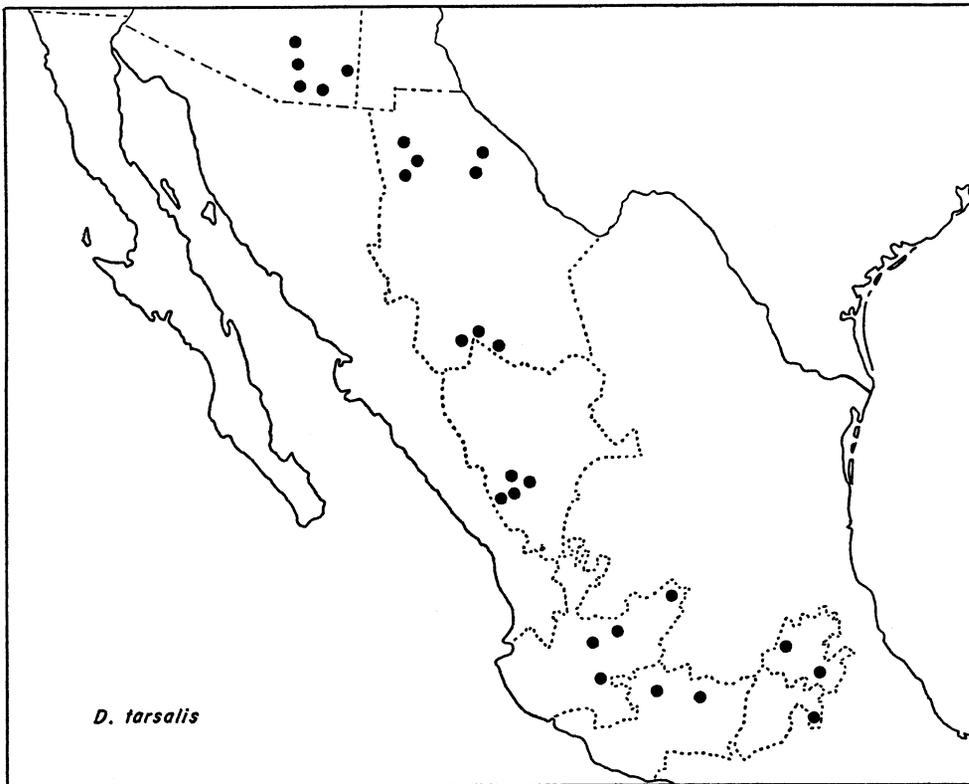


FIG. 30. Distribution of *Diplotaxis tarsalis*.

Head finely, rather densely punctate. Clypeus without hairs, about one-half of the length of head, punctures touching, denser than those on head, margins narrowly reflexed, lateral margins scarcely sinuate, anterior margin truncate between the dentiform angles. Labrum with sides rather prominently pushed forward, front margin only slightly curved, labrum flat in front, a little longer than and level with the reflexed under side of clypeus, densely punctured. Mentum nearly flat, with slight declivity sometimes indicated at anterior fourth, declivity with basal margin pubescent, scarcely margined, nearly straight.

Pronotum rather flat, sides slightly sinuate to front angles which are produced, and almost straight to hind angles which are broadly impressed within, side margins at base often bent upward a little, surface with punctures sparser than on head, base denticulate; scutellum with from five to nine sparse punctures, or densely punctured. Elytra with punctures a little larger than those on pronotum, costae flat, with their row of punctures usually more widely separated than punctures on intervals, surface usually opaque.

Abdomen, last segment sometimes with vague transverse groove above pygidium, segments occasionally tumid at middle. Pygidium punctured sparsely or densely but usually quite irregularly. Front tibiae with outer teeth about equidistant and all teeth well in front of middle. Genitalia as in figure 109.

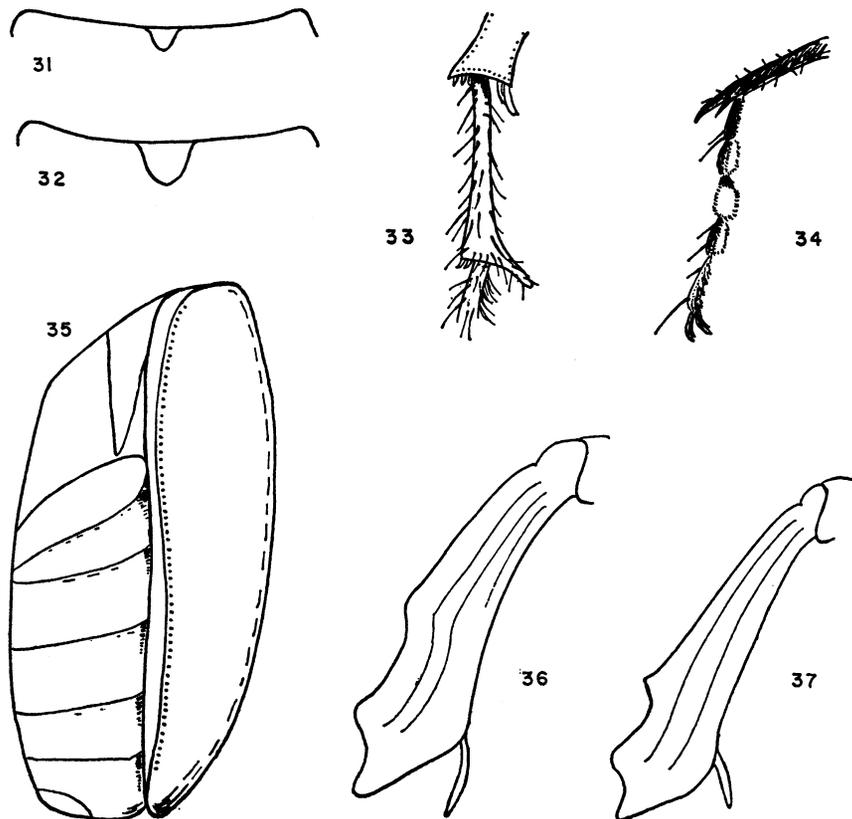
SEXUAL DIMORPHISM: Last segment of maxillary palpi in male triangularly dilated within (fig. 24), not elongate oval as in female. The other sexual characters as in the group.

REMARKS: Although glabrous, *tarsalis* seems more closely related to *bowditchi* and the other hairy species (in the shape of the clypeus, in the normal-sized scutellum, dilated palpi, and male genitalia) than to the glabrous *pubipes* and *maya*. As far as is known, it has the widest geographical range of all the group. It and *pubipes* are the only two species of the group that occur as far north as the

United States. Both species are evidently more abundant in Mexico. I have seen only about 80 specimens of *tarsalis* from the United States and over 200 from Mexico, and three-fourths of the specimens seen of *pubipes* are from Mexico. The former species occupies the highland and mountainous areas of western and central Mexico; *pubipes* occurs in lower altitudes in the east. A series of *tarsalis* was collected with specimens of *bowditchi* in Michoacan at 25 kilometers east of Morelia and in Hidalgo south of where *jacala* occurs.

Many individuals from the north, especially from Arizona, are lighter in color and somewhat smaller than those from southern Durango and Michoacan, but all gradations of color and size occur.

The depression and ridge above the pygidium are often replaced by punctures, but in some individuals they are well marked. Although the last segment of the palpi is enlarged in the males, there is considerable individual variation in the size, also in the degree of dilation. Variation occurs also in the shape of the pronotum, in the depth of the depression at the hind angles, in the tumidity of the abdomen, and in other characters. The front tarsi in the male are not usually notably dilated as they are in some species of the group, but two males from Amecameca, Mexico, have the tarsi and the palpi quite exaggeratedly enlarged. The clypeal angles are rather obtuse, less dentiform, in these and in some other specimens, but this variation oc-



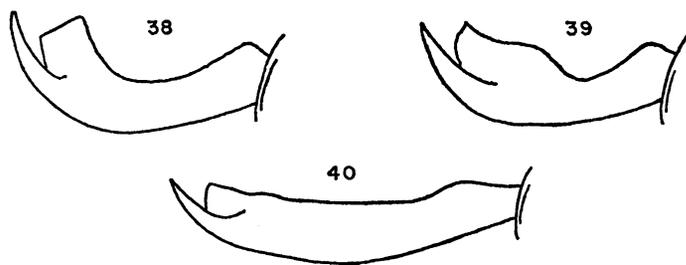
FIGS. 31-37. Body parts of the *puberea* group of *Diplotaxis* (not all to same scale). 31. Scutellum of *D. pubipes* and *D. maya*. 32. Scutellum of *D. tarsalis* and other species. 33. First tarsal segment on right middle leg of *D. spina*, showing inner apical projection. 34. Front tarsi of *D. tarsalis*. 35. *D. tarsalis* (also *D. jacala*), showing rolled-back edge of elytral margin. 36. Front right tibia of *A. spina*. 37. Front right tibiae characteristic of *jacala* and of others of the group.

curs sporadically throughout the range and is probably caused by wear. The male genitalia vary in the size of the apical "head" on the lateral lobes and in the degree of constriction just behind the head (fig. 109). The epipleurae of the elytra are usually but not always as wide at the apex as near the center, and in eight males and two females from El Salto, Durango, a male from Morelos, a female from Hidalgo, and two males and one female from Michoacan, the margined rim makes an even wider sinuation or swirl before the apex, as in figure 35. A series of nine other specimens from near El Salto do not have the swirl but have the wide apex. Scattered individuals from other localities have the epipleurae narrowing apically.

puberea, not elongate or sinuate. Sides of abdomen may be keeled as in *puberea*; punctuation generally fine and dense, as in *puberea* and *brevipilosa*.

RANGE: Southern Durango and Michoacan in highland Mexico (see fig. 41). Specimens examined are from Mexico: *Durango*: El Salto, June, 1937, seven males, seven females. *Michoacan*: 25 kilometers east of Morelia, June, 1955, 10 males, three females, and 15 miles east of Morelia, July, 1947, two females [these may be this species or *puberea*]; also type, male, and paratype, female from "Missouri," an error in locality. A female from Canelas, if the Canelas is in Durango, is probably this species.

DESCRIPTION: (See diagnostic description



FIGS. 38-40. Types of inner claws of front tarsi in males of the *puberea* group of *Diplotaxis*. 38. *D. bowditchi*, and some *D. puberea*, *microtichia*, and *simillima*. 39. *D. puberea* (some individuals). 40. *D. brevipilosa* and some *puberea* and *microtichia*.

The type of Moser's *mexicana*, a dissected male, from Durango has been examined and seems to be the same species as *tarsalis*. It is light brown, has the pygidial depression well marked, the mentum flat, not declivous, the palpi not notably enlarged, and the epipleurae at apex without swirl.

Diplotaxis bowditchi Fall

Figures 26, 38, 41, 108

Diplotaxis bowditchi FALL, 1909, p. 25 ("Missouri," error for Mexico; new type locality here designated by me as El Salto, Durango, Mexico; type, male, in Museum of Comparative Zoölogy).

DIAGNOSIS: Large, dark red or black, pubescent dorsally. Widest palpi of males of the five species discussed below, but front tarsi narrow, as in males of *puberea*; genitalia long as in *brevipilosa*; front inner claws of male short as in *simillima*, some *microtichia*, some

of group for characters omitted here). Length, 10.5 to 11 mm. Head hairy, densely punctured. Clypeus hairy, about one-half of length of head, punctures larger than those on head, margins narrowly reflexed, front margin slightly emarginate between the dentiform angles, lateral margins slightly or strongly sinuate, usually strongly. Labrum flat in front, slightly concave behind at middle, front margin arcuate; scarcely longer medially than reflexed under side of clypeus; finely, densely punctured. Mentum usually rather flat, its anterior declivity indicated only by transverse row of hairs and in some individuals by a weak margin at rear.

Pronotum rather flat, with fine, short, reclining hairs; sides gently rounded to basal and front angles which are not produced or impressed; punctures about as on head; base denticulate. Scutellum densely punctured.

Elytra with fine reclining hairs in all punctures, hairs longer than distance longitudinally between punctures; elytra densely punctured, punctures same size as or larger than those on pronotum; costae scarcely discernible because their punctures are only slightly smaller than those on intervals, or because all punctures are confused.

Abdomen, last segment with definite transverse groove and ridge above pygidium, some individuals with sides of abdomen somewhat keeled or sharp, not rounded. Pygidium densely punctured with punctures of same size as those on sides of abdomen. Front tibiae with apices of outer teeth about equidistant and all teeth placed well in front of middle. Genitalia as in figure 108.

SEXUAL DIMORPHISM: Front tarsi in male one and one-half times longer than front tibiae, only slightly longer in female; front tarsi twice as wide as in female but only slightly wider than segments on other tarsi of male. Inner claw of front tarsi with unguis often expanded in male, and apically rounded. Last segment of maxillary palpi angularly dilated within in male so that it is at least twice as wide as in female (figs. 24, 26). Other sexual characters as in the group.

REMARKS: When Fall described this species, of which he had two specimens from the Bowditch collection, he found it "more characteristic of the Mexican fauna than our own" and suggested that there was "a possible error in locality." He is evidently entirely correct, because no specimens have ever been seen from the United States except the type and paratype, both of which I have examined. There is another Mexican species (*cephalotes*) from "southern Illinois" also from the same collection and described by Fall which never has occurred in the United States. Dr. P. J. Darlington, Jr., has said (*in litt.*) that "Bowditch himself was an exceptionally careful man . . . the doubtful specimens . . . were probably sold to him by some dealer."

The clypeus is about as in figure 24, but with the sides more sinuate. The dilation of the male palpal segment is very striking, as it is also in most males of *tarsalis*. The male genitalia appear to be quite constant; they were dissected from 15 males.

In a series of 13 fresh specimens collected

by Dr. and Mrs. Richard B. Selander at light in June, 1955, near Morelia, Michoacan, two of the females and four of the males have the sides of the abdomen rather sharply keeled, whereas the other specimens have them rounded without any demarcation. Of two females taken together in July, 1947, also near Morelia, one has the abdomen keeled, one has it rounded. All the Durango specimens have the abdomen rounded. This same variation occurs in the type and some other specimens of *puberea*, but has not been found to occur in other species of the group. This character of the ridged or not ridged abdomen (it is not a strong ridge in this group), which has seemed to me a quite stable diagnostic character, breaks down also in another hairy species (*poropyge*) of the *puberula* species group.

DISCUSSION OF *bowditchi* AND RELATED SPECIES

This species (*bowditchi*) and the four that follow (*puberea*, *brevipilosa*, *microtichia*, and *simillima*) are so similar that it is possible that some of them are not separate species. However, they differ from one another quite constantly in the conformation of the male genitalia which is a good diagnostic character in most sections of the genus. Thus, in the material at hand, with the exception of three males (discussed below), I can at once identify each of the 50 dissected males as belonging to one of the five described species by the differences in the shape of the male organ (see table 2). Secondary sexual characters of the males (relative width of tarsal segments and palpi and relative length of claws) support, as a rule, the identifications based on the male genitalia. The internal sacs (not examined for *brevipilosa*) also present slight differences, those of *puberea* and *bowditchi* being narrower, more elongate, those of *microtichia* and *simillima* becoming abruptly bulbous. The sacs of the latter two species are very similar and seem to contain some kind of hairy lining. The sac of *bowditchi* (two specimens examined, one with ridged abdomen from Morelia, one without ridge from El Salto) has a pattern of dark lines within that is completely lacking in *puberea*.

With the specimens available we know that at least two of these forms are separate spe-

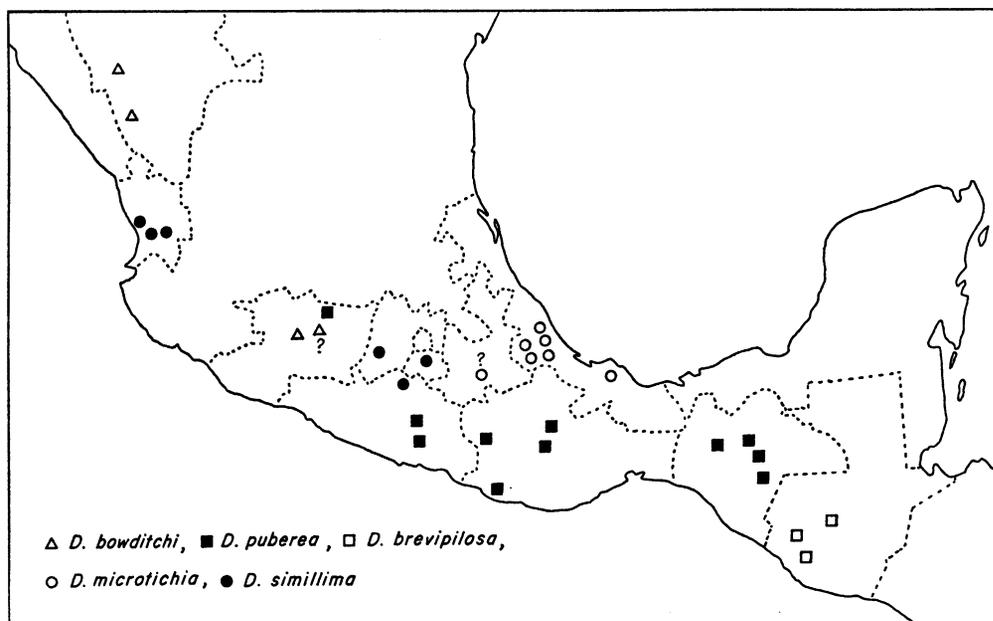


FIG. 41. Distribution of *Diplotaxis bowditchi*, *puberea*, *brevipilosa*, *microtichia*, and *simillima*.

cies. These are *bowditchi* and *puberea* which are definitely sympatric in the state of Michoacan (Morelia) where they show no signs of intergradation. As far as the others are concerned, the distributional gaps in their ranges (see map, fig. 41) are so large and the localities where some have been collected are so scattered that no conclusions can be drawn. Thus we have a population of *bowditchi* from southwestern Durango and two populations from north central Michoacan, but no populations between these places. Of *simillima* we have a number of populations around Tepic in Nayarit on the Pacific coast, then at quite a great distance others inland on the plateau south of Mexico City, but no material from intervening areas. *Puberea* occurs on the plateau on the southern Pacific coast from Michoacan to Chiapas, and *microtichia* in the Atlantic or Gulf coast mountains of Veracruz and from somewhere in the state of Oaxaca, but we do not know whether they meet across the isthmus. Until additional material from other localities becomes available, therefore, it seems best to treat these forms as distinct species.

The additional material, however, must include males, because the females cannot generally be distinguished externally, al-

though *microtichia* and *simillima* usually have sparser, larger, coarser punctuation than the three other species, and more shining, never alutaceous, dorsal surface. I have two females from 15 miles west of Las Cruces, Chiapas, one of which might be *microtichia* and one of which might be either *puberea* or *brevipilosa* on the basis of punctuation. Other females from Chiapas, Puebla, Michoacan, Veracruz, and Distrito Federal have had to be identified only tentatively (see ranges of the various species). There are other instances in the genus, especially in the many species of the *trapezifera* group, in which only the males can be placed with certainty.

I mention above that three of the males proved exceptions to the constancy of form of the genitalia. Additional specimens are needed to decide whether these are aberrant individuals or not. I believe the male from El Mogote, Guerrero, near Taxco, is one such, because another male with the same data on the label has normal and typical genitalia of *simillima*. The lobes of the genitalia in the unusual specimen were evidently somewhat twisted upon dissection, which may account for part of the difference, but they are not perfectly flat dorsally as are those of other *simillima*, and they are slightly bulbous be-

fore the apex. They are not exactly like any of the other genitalia.

The two other males are from 7 miles west of Tuxtla Gutierrez, Chiapas. They have been identified as *puberea* even though the lobes of the genitalia have a much larger and longer "head" apically (fig. 112); the lobes are joined near the base as they should be for *puberea*, but they are longer than most. The front tarsi of these Chiapas specimens are wider than in either *puberea* or *brevipilosa*, more as in *microtichia*, but they are long, as in *brevipilosa*. The inner front claws are elongate as in *brevipilosa* (fig. 40) and as in two males of *microtichia*, whereas other males of *puberea* from Chiapas (Las Rosas) have a curious sinuation on the front inner claws (fig. 39). Populations from the periphery of the range often tend to differ slightly, and these Chiapas examples were collected at the extreme of the range of *puberea* as known so far.

All the five species except *brevipilosa* (of which only four specimens have been seen) have tiny denticulations along the base of the pronotum, most marked in *bowditchi*; all have the second segment of the antennal funicle as long as the first, the latter being more or less globular; all show some variation in the sides of the pronotum which are most sinuate behind the middle in *brevipilosa*; in the male all have the front inner claws slightly or definitely longer than the outer, most marked in *brevipilosa*, but the difference is difficult to see when the claws are open, which is usually the case. The rim or epipleura of the elytra is either narrow at the apex, or widened as in *tarsalis* (fig. 35), but is seldom widened in *microtichia*. The pygidium of the males is very large, appearing nearly square, but actually it is wider than long; it is as large as in some species of *Liogenys*, but in that genus it is longer than wide.

Other similarities of these five species are not repeated in all the formal descriptions. Instead the first species (*bowditchi*) is described, and the descriptions of the others are limited to statements of how they differ from *bowditchi*. The male genitalia are summarized in table 2.

These species differ from both sexes of others of the *puberea* group as follows: from *tarsalis*, *pubipes*, and *maya* by having hairy dorsal vestiture; from *spina* by having the

front margin of the clypeus narrower and not so truncate between the clypeal angles; from *jacala* by having these angles dentiform, or subacute, or obtuse, but never broadly rounded.

Diplotaxis puberea Bates

Figures 38-40, 41, 112, 115

Liogenys pubereus BATES, 1887 (1887-1888), p. 156, pl. 9 (type locality not designated, but type, male, is from Oaxaca, Mexico, in British Museum).

DIAGNOSIS: Large, dark red or black, pubescent dorsally. Last palpal segment of male not so wide as in *bowditchi*, nor so narrow as in *microtichia* and *simillima*, but varies in width; tarsi narrow as in *bowditchi*; genitalia short as in *microtichia* and *simillima*; front claws of male short as in *bowditchi*, sinuate as in figure 39, or elongate as in *brevipilosa* and some *microtichia*. Abdomen may be keeled as in *bowditchi*; punctuation fine and dense as in *bowditchi* and *brevipilosa*.

RANGE: Northern Michoacan, central Guerrero, Oaxaca, and Chiapas in the highlands of Mexico. ?Veracruz. Thirty-six specimens from at least 13 localities have been examined. (See Appendix for further data, also fig. 41.)

DESCRIPTION: Length, 10.5 to 12 mm. The same as given for *bowditchi* except lateral margins of clypeus usually only slightly sinuate, not strongly; anterior declivity of mentum usually sharply delimited, not nearly flat; pronotum with sides often sinuate behind middle, and base not noticeably denticulate. Genitalia as in figures 112 and 115.

SEXUAL DIMORPHISM: Front tarsi as in *bowditchi*. Inner claw of front tarsi either as in *bowditchi* or sinuate (fig. 39). Last palpal segment a little wider than in female.

REMARKS: (See discussion under *bowditchi*). Bates (1887-1888, p. 156) called this species "an aberrant *Liogenys* with characters showing affinity with *Diplotaxis*"; but the "aberrant" characters actually are illustrated more effectively by *bowditchi* (more dilated palpi) or by *microtichia* and *simillima* (larger, more dilated front tarsi), but Bates had no males from the regions where the other species occur. I have examined Bates's material at the British Museum and find that his variety, a female, "*Cuprascens*; *sparsius punctatus*, *ferenudus* (?*detritus*)" from Panistlahuaca, Oax-

aca, is not this species and is in reality not even a hairy species. Two of the other "*Liogenys*" reported by Bates are also *Diplotaxis*. He gives Cordoba, Veracruz, as one of the localities for his *puberea*, but the only specimen from Cordoba I found at the British Museum is one of the two "*Liogenys*" just mentioned; it is a female and seems to belong to the species *microtichia*. I did see another female from Veracruz (no further locality) which has the abdomen slightly keeled and the pronotal punctuation very fine, and this is probably *puberea*; it would be interesting to know from what part of the state this specimen comes. About the same number of examples of *puberea* as of *bowditchi* have the sides of the abdomen rather keeled (including the type); three-quarters of the examples have the abdomen rounded laterally.

There is much individual variation in this species, in the abdomen, as stated, also in the degree of dilation of the palpi of the male, in the amount of sinuation to the sides of the pronotum in both sexes, in the front claws of the male, and in the size of the "head" on the male genitalic lobes. The front claws are usually as shown in figure 38, with the tooth expanded or rounded, but six males from Las Rosas, Chiapas, have a marked sinuation (fig. 39). The only other males from Chiapas are two from Tuxtla Gutierrez, discussed under *bowditchi*. In these, which also have a larger "head" on the genitalia, the sinuation of the claws is lacking, and the entire claw is elongated as in *brevipilosa* (fig. 40). There is, however, a scarcely noticeable sinuation present on the elongated claw in both species.

Diplotaxis brevipilosa Moser

Figures 40, 41, 108

Diplotaxis brevipilosa MOSER, 1918, p. 302 (Guatemala City, Guatemala; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Large, dark red, pubescent dorsally. Last palpal segment of male slightly dilated as in *puberea*; male front tarsi wider than *puberea* and *bowditchi*, but not so wide as in *microtichia* and *simillima*, and very long; genitalia long as in *bowditchi*: male front claws elongate, straight, cleft apically (fig. 40) as in some *puberea* and some *microtichia*. Abdomen not keeled; punctuation fine and dense as in *bowditchi* and *puberea*.

RANGE: Highlands of Guatemala. The type (male) and paratype (female) from Guatemala City have been examined, also a male taken at light at Panajachel in Solola, April, 1956, at about 5000 feet, and a female, presumably this species, from Yepocapa in Chimaltenango, March-April, 1953. Yepocapa appears on the map of Hispanic America (American Geographical Society, 1945) as San Pedro Yepocapa; it is only about 35 kilometers southeast of Panajachel and Lake Atitlan (see fig. 41).

DESCRIPTION: Length, 11 to 12 mm. The same as given for *bowditchi* except anterior declivity of mentum seems more sharply delimited, not so flat, and the pronotal sides are strongly sinuate behind middle; the abdomen without keel. Genitalia as in figure 108.

SEXUAL DIMORPHISM: Front tarsi as in *bowditchi* but wider. Male with both front claws longer, narrower, and straighter than in female, and cleft nearer apex; last palpal segment a little wider than in female. Other sexual characters as in group.

REMARKS: (See also discussion under *bowditchi*). The combination of strongly sinuated sides of the pronotum, the toothless base of the pronotum, the front claws of the male (fig. 40), the long, narrow genitalia, and the southern distribution (Guatemala) serve to characterize this species as known from the type and one other male (the female paratype has the pronotum strongly sinuate, but another female has it only slightly sinuate). Some of the other species, however, possess one or more of these characters, and also the characters may prove to be more variable in *brevipilosa* when more than four specimens (one doubtful) become known. In *puberea* many individuals have the pronotal sides sinuate, but none has them quite so sinuate as the two males of *brevipilosa*; in both *puberea* and *microtichia*, a few males have elongated front claws as in *brevipilosa*.

Diplotaxis microtichia Moser

Figures 38, 41, 113

Diplotaxis microtichia MOSER, 1921, p. 179 ["Mexico (Coatepec, Huatusco)," here restricted to Coatepec, Veracruz, the locality that appears on the type label. Huatusco is another locality not far south of Coatepec; type, male, in Zoologisches Museum, Berlin].

DIAGNOSIS: Large, dark red or black, often with faint greenish sheen, pubescent dorsally. Males of this species and *simillima* have the narrowest palpi of the five species under discussion, and the widest and shortest front tarsi; genitalia short as in *puberea* and *simillima*; male front claws occasionally elongate as in *brevipilosa* and some *puberea*. Abdomen not keeled; punctuation coarse as in *simillima* and sparse on head and pronotum.

RANGE: Southeastern Mexico in the sierras of central Veracruz; also in the southern part of the state, and in Oaxaca (probably northern part), perhaps eastern Puebla (see fig. 41). A total of 54 specimens have been examined (see Appendix).

HABITAT: A series of 44 specimens were collected by P. and C. Vaurie by headlamp at night on a weedy, bushy hillside on the shores of Lake Catemaco, a volcanic lake south of San Andres Tuxtla, along with a few individuals of *poropyge* Bates, a smaller hairy species, and hundreds of specimens of *simplex* Blanchard, a small glabrous species. Some of the weeds were of the family Rubiaceae.

DESCRIPTION: Length, 10.5 to 12.5 mm. As in *bowditchi* but clypeus often has front margin more deeply, not slightly, emarginate, and the angles are often bluntly angulate, not forming so definite a tooth; anterior declivity of mentum usually sharply delimited, not nearly flat; pronotum usually punctured more sparsely; elytra with larger, coarser punctures; abdomen without keel. Genitalia as in figure 113.

SEXUAL DIMORPHISM: Front tarsi of male five to six times wider than in female, longer than in female; inner claw of male with tooth expanded at apex as in *bowditchi*, or claw elongate; palpal segments of male of virtually same size as those of female. Other sexual characters as in group.

REMARKS: (See also discussion under *bowditchi*). The male of this species has the front tarsi even wider than in many of the species of the genus *Liogenys*. In fact Bates, who considered *puberea* also a *Liogenys*, recorded a female from Cordoba, Veracruz (I have examined his specimen), as "7. *Liogenys* (?) ———?," remarking (1887–1888, p. 157) that "it is of bright metallic colour and certainly distinct from *Liogenys pubereus*, but its genus cannot be determined without a knowledge

of the other sex." The color, I must add, is no longer bright metallic, but the elytra have a tinge of the greenish sheen characteristic of *microtichia*, which species it is.

In the large series of 44 specimens from Lake Catemaco in southern Veracruz, all but two or three have the front angles of the clypeus rather obtusely angulate, not forming a distinct tooth, but, because some individuals of this species have the clypeus definitely dentiform, I call it "dentiform" in the tabulation of the species in table 1. Two males without further locality than "Oaxaca" and "Prov. d'Oaxaca" have the inner front claws less curved and more elongate than usual, as in figure 40 of *brevipilosa*: these two have the widest tarsi I have seen.

Diplotaxis simillima Moser

Figures 38, 41, 114

Diplotaxis simillima MOSER, 1921, p. 180 ["Mexico (San Blas), Tepic," here restricted to San Blas, Nayarit (see remarks below); type, male, in Zoologisches Museum, Berlin].

DIAGNOSIS: Large, dark red or black, pubescent dorsally. Males of this species and *microtichia* have the narrowest palpi of the five species under discussion, and the widest and shortest front tarsi; genitalia short as in *puberea* and *simillima*; male front claws short as in *bowditchi* and some *puberea* and *microtichia*. Abdomen not keeled; punctuation coarse as in *microtichia* and sparse on head and pronotum.

RANGE: At high elevation (2000 to 3500 feet) around Tepic, Nayarit, on the west coast of Mexico; also at lower elevations at San Blas, sea level, in same state. No specimens have been seen from the area between these localities and the highlands south of Mexico City where the species also occurs. A total of 20 specimens have been examined. (See Appendix for locality data; also see fig. 41.)

HABITAT: The specimens taken at Tepic in 1953 by P. and C. Vaurie were collected from weeds in a field at night, along with another hairy species (*costanera*) and many glabrous species of the genus.

DESCRIPTION: Length, 10 to 12.5 mm. As in *bowditchi* but clypeus more deeply emarginate; anterior declivity of mentum sharply delimited; pronotum usually more sparsely

punctured; abdomen without keel. Genitalia as in figure 114.

SEXUAL DIMORPHISM: Front tarsi of male four to five times wider than in female, longer than in female; inner claw, male, expanded at apex; palpal segments virtually same size as those of female. Other sexual characters as in the group.

REMARKS: (See also discussion under *bowditchi*). Moser's type has on the label "San Blas Jalisco," although Moser gives "(San Blas), Tepic" in his text. This Jalisco evidently refers not to the state of that name (there is no San Blas I could find in Jalisco), but to a small place south of Tepic in the State of Nayarit. Tepic, in turn, is southeast of San Blas and all three places are about equidistant. As San Blas appears both in the text and on the label of the type, I have restricted the type locality to San Blas.

The only certain character that separates this species from *microtichia* is the shape of the male genitalia, although with additional male material the locality alone may prove sufficient in most cases. Except for the aberrant individual from Guerrero discussed under *bowditchi*, the males of this species have quite constant genitalia which are readily distinguishable from those of the other related species by the wider space between the lobes at center (even wider than shown in fig. 114) and by the distinctly flat aspect.

***Diplotaxis spina* Vaurie, new species**

Figures 25, 29, 33, 36, 110

TYPE MATERIAL: Type, male, Oaxaca, Oaxaca, Mexico, 5034 feet, July 4, 1955, C. and P. Vaurie, collectors, in the American Museum of Natural History. One male and eight female paratypes, same locality and collectors, but eight of these taken June 30, 1955. Paratypes deposited in the American Museum of Natural History and the British Museum (Natural History).

DIAGNOSIS: Large, dark red, pubescent dorsally. Although close to *jacala*, this species differs from it and from all others in the group by having the first segment of the middle tarsi in the male spined within at apex (fig. 33), and the lateral lobes of the genitalia more strongly deflexed at apex. Females are differentiated from females of *jacala* by the dentiform, not rounded, clypeal angles, and

from females of the other hairy species of the group by having the basal tooth of the front tibiae somewhat more median and farther removed from the other teeth (a not too reliable character).

RANGE: The only specimens yet seen are from Oaxaca in southern Mexico.

HABITAT: The type and paratypes were collected at night in a grove of young pepper trees (*Schinus molle*) on the hillside above the city of Oaxaca in the vicinity of the statue of Juarez. Among these trees were also some young feathery trees of the Mimosaceae family (*Enterolobium cyclocarpum*), often called commonly *cuanacastle* in Oaxaca. The specimens were partly muddy when captured; they were picked from the leaves or young stems, but had evidently come out of the earth. At the same locality in the daytime no beetles were found on the vegetation; no attempt was made to dig in the soil.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Length, 11 mm. Head uniformly densely punctured. Clypeus hairy, one-half of length of head, punctures of same size and density as on head, margins narrowly reflexed throughout, angles dentiform, acute, lateral margins sinuate in front of eye, anterior margin straight. Labrum slightly convex and advanced beyond the under side of clypeus, faintly punctured, arcuate in front, somewhat longer medially than reflexed under side of clypeus. Mentum declivous at anterior third, declivity arcuate, margined and pubescent posteriorly.

Pronotum as in *bowditchi*, but basal denticles not visible. Elytra as in *bowditchi*, but punctures larger than on pronotum, and costal punctures same size as those on intervals. Scutellum, abdomen, and pygidium as in *bowditchi*, but abdomen not keeled. Front tibiae with apices of outer teeth not equidistant, the basal tooth more widely separated (fig. 36) and nearer middle of tibiae. Genitalia as in figure 110; the tips are strongly bent downward away from view.

SEXUAL DIMORPHISM: The male (type) has the last segment of the maxillary palpi triangularly dilated within (fig. 25); females have it oval and narrow. Front tarsi of male larger and thicker throughout than that of female, but not noticeably larger than other

tarsi of male. First segment on middle tarsi of male has hairs but no hairy pad below and has the inner apex prolonged into a thick spine (fig. 33), the spine sometimes partially hidden by hairs. Middle and hind tibiae of male fringed within in apical half with yellow hairs. Front claws nearly straight, longer, narrower, more shallowly cleft and less angularly bent than in female or than the claws of middle and hind legs (about as in *zeteki*, fig. 43, but claw narrower). Other sexual characters as in group.

REMARKS: This is probably an uncommon species, at least at the time and place of capture in 1955, because only 10 individuals were collected in Oaxaca of a total of about 900 specimens of other species of the genus.

A projection of the apex of the first segment of the middle tarsi occurs also in males of some other Mexican species, in two that are undescribed, and in *pilifera*. In the two former species the projection is broader, not so narrow and spine-like, and the same segment is prolonged also on the hind legs; in *pilifera*, a much smaller species, the spine is proportionately smaller. In a hairy species (*arizonica*) from the United States and northern Mexico, there is a prolongation of the apex of the middle tibiae, not tarsi, in the male. No doubt there are further such modifications yet to be discovered in the males.

The 10 specimens of *spina* have the clypeus truncate in front, not at all emarginate, much as in the glabrous *tarsalis* in which, however, there is a shorter distance between the dentiform angles than in *spina* (see figs. 24, 29); in *spina* the front margin is longer than either of the side margins. This long, truncated margin, with its dentiform angles, will distinguish *spina* from other pubescent species of the group, if the front tibiae do not have the basal tooth at middle (see diagnosis above). The lateral angles of the clypeus are worn down on two of the paratypes; the dorsal hairs are rubbed off here and there on all the paratypes; in most specimens the basal margin of the pronotum is smooth, and it is just perceptibly scalloped in a few. The size is uniform, from 10 to 11 mm.; the dark red coloration appears black to the unaided eye. The triangular dilation of the palpi on the two males is rather nearer the apex of the segment, whereas in *bowditchi*, *tarsalis*, and in

some *puberea* it is either nearer the middle or the base, although somewhat variable in all four species (see figs. 24, 25). The claws on the front tarsi of the males appear proportionately narrower than in other species. The male genitalia (fig. 110) are more slender than those of *bowditchi* and *brevipilosa*, narrower in front, with the apices more deflexed.

***Diplotaxis jacala* Vaurie, new species**

Figures 28, 35, 37, 111

TYPE MATERIAL: Type, male, 6 miles north of Jacala, Hidalgo, Mexico, 6000 feet, June 23, 1955, C. and P. Vaurie, collectors. Eleven male and four female paratypes, same data. Type and some paratypes are in the American Museum of Natural History; other paratypes are in the British Museum (Natural History) and Zoologisches Museum, Berlin.

DIAGNOSIS: Large, dark red, pubescent dorsally. This species is distinguished from the other pubescent species of the group by having the front angles of the clypeus broadly rounded, never acute or dentate, and the front margin deeply emarginate, and the front tarsi of the male no larger than those of the female.

RANGE: Hidalgo, east central Mexico, in the highlands.

HABITAT: The type and paratypes were taken from low vegetation at night along the edges of a clearing in the mountains near Jacala; some of the vegetation included two species of *Rhus*. The beetles were in the company of two other hairy species of a different group (*puncticollis* and *hirsuta*) and the rather rare glabrous species *fossifrons* Moser, also many specimens of an undescribed glabrous species.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Length, 11 mm. Head hairy, but hairs so fine as to be visible in profile only; finely, densely punctured, punctures partially confluent and rugose. Clypeus hairy, a little less than one-half of length of head, front angles broadly rounded, punctures larger, denser than those on head, margins narrowly reflexed, more broadly so behind the rounded angles; lateral margins sinuate in front of eye, front margin broadly emarginate. Labrum as given for *bowditchi*

but scarcely punctured. Mentum declivous at anterior fourth, declivity arcuate, margined and pubescent posteriorly.

Pronotum as in *bowditchi*, but surface a little more sparsely punctured than on head. Scutellum densely covered in basal half with punctures. Elytra as in *bowditchi*, and with punctures of about same size as those on pronotum. Abdomen as in *bowditchi*, but no keel present on sides. Pygidium and front tibiae as in *bowditchi*. Genitalia as in figure 111.

SEXUAL DIMORPHISM: Same as for group.

REMARKS: Dorsally this species resembles the other hairy species of the group except that the clypeus has the lateral angles distinctly rounded, not angulate (fig. 28); also the male does not have either the front tarsi or the last segment of the palpi enlarged. The genitalia (fig. 111) and clypeus most resemble those of *pubipes*, although the front margin of the clypeus in *jacala* is more deeply emarginate. The elytra, when viewed in profile, have the epipleurae somewhat wider before the apex than at a point opposite the hind coxae (fig. 35), a character found in a few other species, in *tarsalis* of this group, also *ingenua* Fall, and others. Sometimes individuals can be found in the same species that have the epipleurae narrowing apically, but in *jacala* all 16 specimens have them widened. The paratypes are quite uniform in size, ranging from 10 to 11 mm. in length.

Diplotaxis pubipes Schaeffer

Figures 31, 42, 111

Diplotaxis pubipes SCHAEFFER, 1907, p. 65 (Esperanza Ranch, Brownsville, Texas; type in United States National Museum).

DIAGNOSIS: Small to medium-sized, light to dark red, glabrous dorsally except for a few stray hairs on front of clypeus. Distinguished from all species of the group except *maya* and also from others of the genus by the exceedingly small scutellum (fig. 31). Differs very little from *maya* from southern Mexico and Guatemala except that the clypeus has rounded, not dentiform, angles and is indented in front of the eyes, not straight or sinuate.

RANGE: From central Veracruz north along the coast of eastern Mexico to the southern tip of Texas. A total of 79 specimens has been examined, the majority of which are from

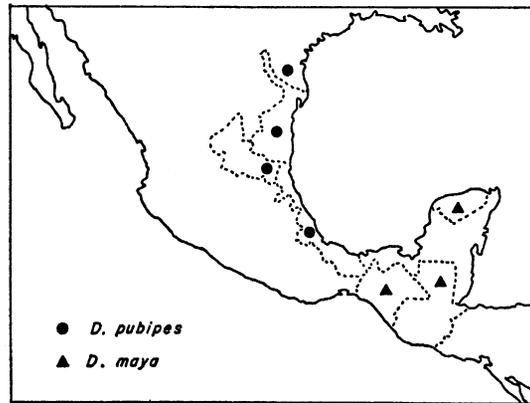


FIG. 42. Distribution of *Diplotaxis pubipes* and *D. maya*.

Mexico. (See Appendix for locality data; see fig. 42.)

HABITAT: Eight specimens taken at Pantla, Veracruz, by P. and C. Vaurie were among some 400 *Diplotaxis* picked at night from vegetation in a weedy, bushy, grassy field. Some of this vegetation was catclaw, some *pata de vaca* (*Bauhinia mexicana*). Two individuals from Ciudad Victoria were taken on *Cryptostegia*, a tropical rubber vine from India of which the species *grandiflora* (family Asclepiadaceae), according to Standley (1924, p. 1167), is thoroughly naturalized in the state of Sinaloa in western Mexico.

DESCRIPTION: (See diagnostic description of group for characters omitted here.) Length, 8.5 to 10 mm. Head and clypeus punctured about as in *tarsalis*. Clypeus with a few hairs on front margin (seen by tipping the specimen sideways), truncate in front, with prominently reflexed but rounded angles, about one-half of length of head, margins more broadly reflexed than in *tarsalis*, lateral margins deeply indented in front of eye, forming an obtuse angle within. Labrum flatter than in *tarsalis* and no longer than reflexed under side of clypeus. Mentum with anterior declivity at apical third or fourth slightly pushed forward, base of declivity margined, pubescent, and arcuate.

Pronotum proportionately longer than in *tarsalis* and with the angles not at all impressed, otherwise the same; scutellum and scutellar area depressed, scutellum very short and scarcely wider at base than one sutural interval. Elytra, abdomen, pygidium, and

front tibiae as in *tarsalis* except elytra usually shiny and last segment of abdomen with transverse groove, pygidium punctured sparsely. Genitalia as in figure 111.

SEXUAL DIMORPHISM: Hind tibiae with fringe of thick yellow hairs within at apical half in male (not always very noticeable). Inner claws on front legs, sometimes on middle legs, of male, with tooth slightly expanded, rounded apically, as shown in figure 43 of *zeteki*. Other sexual characters as in group.

REMARKS: Although this species was described from Texas and has not previously been reported from Mexico, Texas evidently represents the northern limit of its range. It resembles *jacala* in the genitalia and palpi of the male, and in the rounded angles of the clypeus, but differs by having the clypeus truncate, not emarginate, in front, and the dorsal surface glabrous, not hairy. It is like *maya* in the genitalia and in the small scutellum and dorsal surface, but differs in the non-dentiform angles of the clypeus and non-dilated palpi (male).

The long silky hairs of the tarsal pads are even longer than they are in *tarsalis*. The "circumstellar" elytral impression mentioned by Schaeffer (1907, p. 65) seems stronger than in other species of the group. The color in 17 examples from Brownsville, Texas, as well as in some of the Mexican series, is black to the unaided eye, but the 30 individuals from Acuna and Zamorina and two from Ciudad Victoria are light brown.

***Diploptaxis maya* Vaurie, new species**

Figures 27, 31, 42, 111

TYPE MATERIAL: Type, male, from 7 miles west of Tuxtla Gutierrez, Chiapas, Mexico, April 2, 1953, R. C. Bechtel and E. I. Schlinger, collectors; seven male and eight female paratypes, same data; one male, El Zapotal, Tuxtla Gutierrez, May 18, 1952; also five males from 4 miles east of Las Rosas, Chiapas, March 12, 1953, same collectors; one female from 15 miles northeast of Los Amates, Chiapas, 2600 feet, March 17, 1954, R. K. Selander, collector; three females from Chichen-Itza, Yucatan, May and June, 1951, 1955, E. C. Welling, L. J. Stannard, collectors; one male from Tikal, Peten, Guatemala, May 12, 1956, T. H. Hubbell.

Type and some paratypes in collection of University of California at Berkeley; one paratype at Natural History Survey, Urbana, Illinois; Instituto de Biología, Ciudad Universitaria, Mexico; other paratypes in the American Museum of Natural History.

DIAGNOSIS: Large, red or black, glabrous dorsally. Very much like *pubipes*, but with the sides of the clypeus merely sinuate, not abruptly indented in front of the eye (fig. 27), the front angles dentiform or subacute, not rounded; scutellum small as in *pubipes* (fig. 31).

RANGE: Chiapas and Yucatan in southern Mexico, and northern Guatemala (see fig. 42).

HABITAT: The paratypes from Peten and Los Amates were taken at light; from Los Amates, in "pine-oak forest."

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Length, 10.5 mm. Head finely, rather densely punctured. Clypeus without hairs, about one-half of length of head, punctures denser than those on head, and rugose; margins slightly turned up, lateral margins strongly sinuate behind the dentiform angles; anterior margin definitely emarginate, clypeus narrowing to front. Labrum as in *tarsalis*, but with the sides flatter, not pushed forward; densely punctured. Mentum with anterior declivity at apical fourth, base of declivity margined, pubescent, and curved.

Pronotum convex, sides evenly arcuate, front and hind angles not produced or impressed, surface with punctures slightly larger than those on head and much sparser, base denticulate; scutellum smaller than in *tarsalis*, with a few punctures at base. Elytra with punctures larger than those on pronotum, costae rather flat, their punctures much smaller and shallower than those on intervals.

Abdomen with deep transverse groove above pygidium. Pygidium with punctures as large as those on elytral intervals, fairly dense, uniformly punctured. Front tibiae with outer teeth nearly equidistant and all well in front of middle of tibiae. Genitalia as in figure 111.

SEXUAL DIMORPHISM: The male (type) has the last segment of the maxillary palpi triangularly dilated within, about as in figure

25 of *spina*; females have it narrowly elongate oval (fig. 26). Front tarsi in type a trifle wider than in females, but not wider than middle and hind tarsi. Other sexual characters as in group.

REMARKS: This species is glabrous, as are also *tarsalis* and *pubipes*, but it occurs much farther south than either; its range coincides with that of the pubescent *puberea* at Las Rosas, Chiapas, and of the pubescent *brevipilosa* in Guatemala. It is very similar to *pubipes*, with the same small scutellum (fig. 31) and same male genitalia, but *maya* has a differently shaped clypeus, and the male lacks the hind tibial fringe of *pubipes*. The front angles of the clypeus are worn down in seven of the 23 paratypes of *maya* so that they are subacute, as in figure 27, not dentiform; the remaining paratypes have sharp, dentiform front angles as shown for *tarsalis* and *spina* in figures 24 and 29. None of the 30 or 40 specimens of *pubipes* examined has any trace of dentiform clypeal angles.

The size range of the paratypes is from 10 to 11 mm. Four of the specimens from Chiapas are reddish brown; the remainder are black. The pronotal punctures on some examples are smaller than, or the same size as, the head punctures, but are always quite sparse. The small denticules of the basal margin of the pronotum and a slight round impression at middle base in front of the scutellum are evident in the majority of specimens, and the scutellar punctation is also constant in the paratype series.

SPECIES GROUP *ohausi*

The following species are included in this group: *Diplotaxis zeteki*, new species; and *ohausi* Moser.

The two species of this group are considered very similar to those of the preceding group, *puberea*. Their characteristics and a comparison with the *puberea* group are given under remarks in the discussion of *zeteki*. These species have not been seen from north of the Mexican state of Chiapas; only 26 specimens have been examined. Collectors of species are Busck, Shannon, and Zetek in Panama; Dalmat and the Vauries in Guatemala; Holzen in Mexico; and Hubbell in Honduras. The type of *ohausi* Moser has been examined.

All the group and specific characters are given under *zeteki*, with which *ohausi* is compared.

Diplotaxis zeteki Vaurie, new species

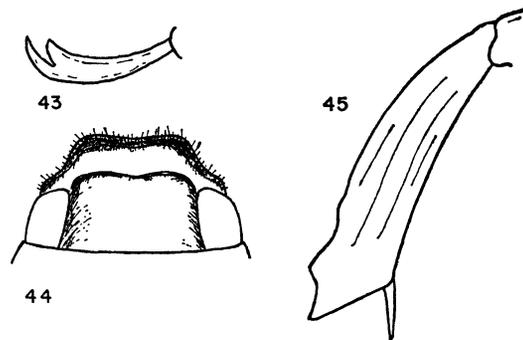
Figures 43-45, 118

TYPE MATERIAL: Type, male, Barro Colorado, Canal Zone, Panama, May 8, 1940, J. Zetek, collector, deposited in United States National Museum. Thirteen paratypes from Panama: Barro Colorado, same collector and date, one male; same collector but May 23-24, also April, three males, six females; Gatun Lake, July 1, 1923 (R. C. Shannon), one male; Cabima, May 29, 1911 (A. Busck), one female; Volcan de Chiriqui, 4000 to 6000 feet (Champion), one female. Paratypes are in the United States National Museum, the American Museum of Natural History, and the British Museum (Natural History).

DIAGNOSIS: Distinct from all known members of the genus in the shape of the male genitalia (fig. 118). Very similar externally to *ohausi* and with the same abruptly indented side margins of the clypeus (fig. 44), but the front margin is more reflexed and the forehead has a ridge or frown that is not present in *ohausi*. The tarsal soles are very hairy in the male, the hairs longer and denser than in *ohausi*, but there are no dense pads as in the *puberea* group.

RANGE: Panama. I have not been able to find the locality Cabima; it may be one of the places submerged by the Canal.

DESCRIPTION OF TYPE, MALE: Color, dark red. Length, 10 mm. Head and clypeus com-



FIGS. 43-45. *Diplotaxis zeteki*, new species. 43. Front claw of male. 44. Head and clypeus, showing ridge. 45. Front tibiae, showing subobsolete basal tooth.

bined shorter than pronotum, head abruptly declivous behind clypeus, the transverse declivous area somewhat convex and with about seven sparse punctures, the rest of head with irregularly placed dense punctures except for an impunctate space at back of head (this space would be hidden if head were withdrawn into pronotum); clypeal suture obliterated at middle. Clypeus with scattered hairs behind front edge, punctured as on head, clypeus more than one-half of length of head, its side margins indented abruptly at right angles in front of eye, front margin virtually truncate and with rounded angles, margins all broadly reflexed. Eyes large, each about one-quarter of width of head. Antennae 10-segmented, club appearing longer than segments of funicle. Maxillary palpi with last segment flattened at base. Labrum sparsely punctured, rather flat, arched in front, scarcely longer than, and on a level with, the reflexed under side of clypeus. Mentum strongly declivous at anterior third, declivity flat, its base arcuate, pubescent, strongly margined. Mandibles small, slender.

Pronotum almost twice as wide as long, widest at about middle, rather flat, punctures sparser than those on head, but of same size, some separated by twice their diameter; sides evenly rounded to angles which are not produced or acute; base punctate and strongly margined; scutellum with about 10 punctures. Elytra with punctures scarcely larger than those on pronotum, second interval multipunctate, costae rather flat, with smaller, sparser punctures, surface very shining, marginal hairs short, sparse.

Abdomen not ridged laterally, no groove above pygidium but large, confluent punctures. Pygidium with larger punctures than on sides of abdomen, punctures irregularly sparsely placed, surface rugose. Front tibiae with two apical outer teeth very close together (fig. 45), the basal or third tooth a little more distant and partially obsolete, all teeth at apical third of tibiae. Middle tarsi with first segment scarcely longer than second. Claws on middle and hind legs small, less than half as long as claw segment, bent abruptly at right angles at middle, deeply cleft, the tooth as long as the claw and closely appressed to it, its apex acute (fig. 7), claws on front legs vary sexually (see below). Genitalia as in figure 118.

SEXUAL DIMORPHISM: Male (type) has tarsi with long golden hairs below but not so thick as to obscure surface of segments; in female, hairs are not so dense. Hind tarsi in male longer than hind tibiae by length of claw segment; first segment of hind tarsi more than a third longer than longer of the spurs. Claws on front legs of male twice as long as on other legs and more than half as long as claw segment, cleft nearer the apex than in female and not bent abruptly, claws less deeply cleft, the tooth shorter than claw but twice as wide (fig. 43); in female front claws are same as other claws.

REMARKS: This and the following long-legged species show some affinity to the *puberea* group, but they lack the thick tarsal pads, have a smaller, more transverse pronotum, not such long first tarsal segments on the middle and hind legs, have hairs dorsally on the front of the clypeus, and have the base of the pronotum margined, not denticulate. The clypeus is rather similar in shape to that of *pubipes* of the *puberea* group, but it is more rectangular, and has the indented angles sharper. Although the clypeus has a few scattered hairs behind the margin, they are not abundant as in most members of the *trapezifera* group, and the species does not resemble members of that group in other characters. The hind tibiae of the male are narrow, straight, and long, as also in the *puberea* group, and with virtually no outward flare apically. The same kind of modification of the front claws occurs as in that group; there is a tendency in the males for the tooth to be filled in where it emerges from the claw, and on one of the male paratypes the tooth on the inner front claw is virtually fused with the claw. The length in the paratype series ranges from 9.5 to 11 mm. The clypeal suture is sometimes distinct at the middle and is either straight or sinuate. The frontal declivity is more pronounced on some individuals and may be more or less interrupted at the middle. The majority of specimens have the basal tooth of the front tibiae distinct, but in three of the 13 the tooth is more obsolete than is shown in the type (fig. 45).

The male genitalia are very different from those of *ohausi* (figs. 116, 118), and in both these forms they are very different from any in the *puberea* group. In fact, the genitalia of *zeleki* are more like genitalia found in species

of the South American genus *Liogenys*, which is exceedingly similar to *Diplotaxis*. The eighth sternite in *zeteki* and *ohausi* (fig. 89) has a very long tail or handle, even longer in the former than in the figure.

Neither this species nor *poropyge* Bates has been recorded previously from Panama, which is the southernmost locality reached by any member of the genus, although Bates listed the paratype from Volcan de Chiriqui (1887-1888, p. 163) as "*Diplotaxis* (?)—?," saying that it was "possibly a *Liogenys*."

The species is named in honor of James Zetek, well-known entomologist, Resident Manager for many years of the Canal Zone Biological Area on Barro Colorado Island, Panama.

Diplotaxis ohausi Moser

Figures 46, 89, 116, 117

Diplotaxis ohausi MOSER, 1921, p. 181 (Coyotenango [Cuyotenango], Guatemala; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Differs from *zeteki* chiefly in the different male genitalia and in the absence of a ridge on the front of the head. Differs from other dorsally glabrous species, except perhaps *pubipes*, in the abruptly cut out or indented side margins of the clypeus (*pubipes* has a tiny scutellum and thick tarsal pads).

RANGE: Along the Pacific coast from Chiapas in southern Mexico to Honduras (see fig. 46). Thirteen specimens have been examined (see Appendix).

DESCRIPTION: Color, dark red-brown. Length, 9 to 10 mm. Head with front evenly, smoothly rounded to clypeus, densely punctured. Clypeal suture usually distinct, clypeus as in *zeteki* but usually shorter than there, with the margins less reflexed, the side margins not at all reflexed, and the hairs scarcely noticeable. Eyes a little smaller than one-quarter of the width of head. Labrum more densely punctured than in *zeteki*. All other characters as in *zeteki*. Genitalia as in figures 116, 117.

SEXUAL DIMORPHISM: As in *zeteki* except that the tarsal hairs are normal in the male, not long and dense.

REMARKS: This species is discussed also under *zeteki*, which precedes. The apically somewhat twisted and reflexed lobes of the male genitalia (figs. 116, 117) are found also

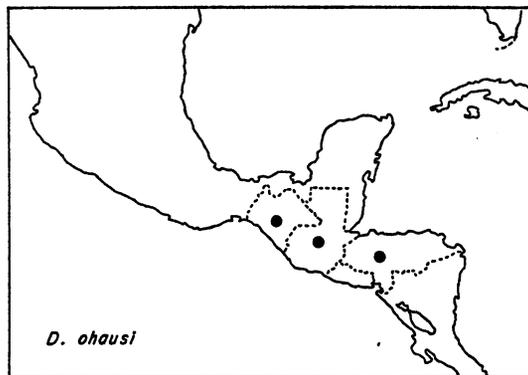


FIG. 46. Distribution of *Diplotaxis ohausi*.

in some species of the *trapezifera* group, as well as in *simplex* Blanchard and in *cribriceps* Bates. All these species are quite different except in the genitalia. The punctures of the elytra in *ohausi* are more crowded in a few specimens than in the others. This is evidently not an abundant species, unless its rarity is but a reflection of lack of collecting.

SPECIES GROUP *moerens*

The following species compose this group: *Diplotaxis knausii* Schaeffer, *fissilabris* Fall, *aulacochela* Cazier, *moerens* LeConte (polytypic), and *anxius* LeConte.

These are medium-sized to large species, only minutely, if at all, hairy dorsally, with the labrum, sometimes also the mentum, distinctly cleft as in figure 48, or at least strongly bilobed (sunken at middle, bulbous at sides), and a large, not notably transverse, densely punctured pronotum with strongly margined, often furrowed sides, and coarsely punctured, rough-surfaced pygidium. The clypeus has rounded angles in all the species, the front margin being rather sinuate at the middle (figs. 48, 53); the tarsal claws are cleft subapically. Some of the males have distinct secondary sexual characters (see table 3).

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Surface dorsally glabrous or at least not noticeably hairy. Head and clypeus united shorter than pronotum. Head densely punctured. Clypeus virtually without hairs, but a few fine ones can be found on scattered individuals, clypeal suture usually obliterated at middle. Eyes moderate in size, each about one-fifth of the width of

TABLE 3
SOME SPECIFIC DIFFERENCES AMONG MALES OF THE *moerens* AND
brevidens GROUPS OF *Diplotaxis*

	First Segment of Front Tarsi	Center of Abdomen	Hind Tibiae
<i>D. moerens</i> group			
<i>knausii</i>	Compressed, enlarged	Tuberculate and/or rugose	Normal ^a or densely fringed
<i>fissilabris</i>	Compressed	Transversely rugose	Normal
<i>aulacochela</i>	Slightly expanded within apically	Vaguely tuberculate	Normal
<i>moerens</i>	Normal	Smooth, occasionally vaguely tuberculate	Normal or densely fringed
<i>anxius</i> ^b	Normal	Smooth, occasionally vaguely tuberculate	Fringed
<i>D. brevidens</i> group			
<i>brevidens</i>	Normal	Sparsely pubescent	Fringed
<i>illustris</i>	Densely ciliate laterally	Densely pubescent	Fringed
<i>fossipalpa</i> ^c	Densely ciliate laterally	Densely pubescent	Fringed

^a "Normal" is with scattered hairs.

^b Claws of front tarsi simple, not cleft.

^c Claws of middle tarsi simple, not cleft.

head, about one-quarter in some males. Antennae 10-segmented, club as long as funicle. Maxillary palpi with a basal impression on last segment. Mandibles small, narrow, not bulbous in front. Pronotum widest at middle, less than twice as wide as long. Abdomen with sides not ridged, fifth segment with deep transverse groove above pygidium. Pygidium coarsely, rugosely punctured with large dense punctures. Front tibiae tridentate, the teeth equidistant or basal tooth a little farther removed, basal tooth either median or not much in front of middle. Middle tarsi with first and second segments about equal in length.

SEXUAL DIMORPHISM: Males with hind tarsi about as long as or slightly longer than hind tibiae, females with them shorter. Males with hind tibial spurs and hind femora narrower than in females; pygidium wider than long, more transverse than in females, and retracted.

DISCUSSION: All the species of the group are nominally glabrous dorsally, but *knausii* and sometimes *fissilabris* have short yellow hairs emerging from some punctures of the elytra; these can be seen only at high magnification and not invariably. The lateral lobes of the male genitalia are rather similar

in all species; all have some hairs ventrally between the lobes, but if the membrane is torn, the hairs are not visible. These species are from either the United States or northern Mexico. One of them (*anxius*) occurs farther north (to the state of Washington) than any of the others; it has not yet been taken in Mexico. Three of the species are reported here for the first time from Mexico (*knausii*, *fissilabris*, and *aulacochela*). All but one (*aulacochela*) occur in Arizona, and all but two occur also in Sonora, and *knausii* and *moerens* extend into Baja California.

Approximately 1800 individuals have been examined, including the types of *fissilabris* and *peninsularis* of Fall, and *moerens* and *anxius* of LeConte. More than half of the specimens are of the species *moerens* alone. Most of the Mexican specimens studied are in the Baja California collections of the California Academy of Sciences which include material from a number of expeditions to that Mexican state: William M. Mann's trip in 1923; from Michelbacher and Ross in 1938, and two short trips by the same two and also by Ross himself in 1939; Ross and Bohart in 1941; and Cazier, Gertsch, and Schrammel of the American Museum of Natural History in 1952.

Most of the other species with the labrum truly bilobed are hairy dorsally and do not seem to be related to this group; they include the three species of the *cribulosa* group, which also have the sides of the abdomen ridged entirely or in part, and two small forms (7 to 8 mm.) of the *rudis* group. Species of the glabrous *corvina* group have the labrum somewhat hollow at the center and the pronotum large, but these species have reduced or vestigial wings, so are quite different in aspect. Fall's *conformis* from New Mexico and Arizona has the labrum concave from side to side, but not bilobed; *mus* Fall also has the labrum deeply hollow, but this is a tiny, scaly species. This group is very close to the *brevidens* group (which follows) in many respects, and the internal sac of the male genitalia is quite similar in both groups.

KEY TO THE SPECIES OF THE *moerens* GROUP¹

- 1. Labrum and declivity of mentum deeply cleft (fig. 48) 2
 - Labrum deeply concave throughout center, not cleft, declivity of mentum flat or slightly concave 5
- 2. Front of head behind clypeus deeply triangularly impressed; entire front margin of clypeus strongly reflexed; labrum (fig. 48) with lobes very large and usually visible from above when specimen is tipped backward; male with first segment of front tarsi almost twice as big as second or following segments (fig. 49) *knausii*
 - Front of head scarcely, if at all, impressed; front margin of clypeus not reflexed at center (though it may be at side angles); labrum with lobes small, never visible from above when specimen is tipped backward; male either with first two segments of front tarsi of same size or first segment scarcely larger (fig. 52) 3
- 3. Ligula and declivity of mentum deeply, sharply V-shaped halfway to base of mentum; male with longitudinal rugae at center of abdominal segments, and with front tarsal segments strongly compressed. *fissilabris*
 - Ligula and declivity of mentum not deeply V-shaped, concavity reaching only about one-third of way to base of mentum; male with abdominal segments either smooth or with

- vague swellings, not rugose, and with front tarsi having only the first segment, if any, compressed 4
- 4. Pronotal sides broadly depressed or furrowed along margin; second elytral interval usually with two rows of punctures or with punctures confused; head usually continuous with clypeus, not interrupted at suture; male with hind tibiae densely fringed within with yellow hairs; Baja California, Mexico *moerens peninsularis*
 - Pronotal sides not broadly depressed along margin; second elytral interval usually with single row of punctures; head and clypeus usually interrupted either by depression or by swelling of clypeal suture; male with hind tibiae only sparsely hairy; Texas, and Chihuahua, Mexico *aulacochela*
- 5. Head bi-impressed between eyes, or, if impressions vague, then clypeal margin is strongly reflexed; male with front tarsal claws simple, not toothed *anxius*
 - Head without depressions but presenting uniformly punctured surface; margin of clypeus scarcely, if at all, reflexed; male with front tarsal claws toothed *moerens moerens*

Diplotaxis knausii Schaeffer

Figures 47-49, 119

Diplotaxis knausii SCHAEFFER, 1907, p. 64 (Las Vegas, Nevada; type, male, in United States National Museum).

DIAGNOSIS: Very similar to *fissilabris* and *aulacochela*, but differing from them and from the other members of the group by having the labrum and mentum much more deeply and broadly cleft, the labrum forming two large projecting lobes that are usually as deeply excavated as the last palpal segment or the antennal club are long (fig. 48). The only species of the group in which the male has the enlarged first segment of the front tarsi greatly dilated apically, sometimes to twice the width of the second segment and the second segment carinate and twisted at base on outer side. Minute hairs sometimes visible on outer rows of elytra.

RANGE: Nevada and the southern parts of Arizona, New Mexico, and California, south into northern Baja California and Sonora, Mexico. About 450 specimens have been examined, all but 60 of them from the United States. (See Appendix for locality data; see fig. 47.)

HABITAT: According to Dr. C. A. Frost

¹ On some specimens of *knausii* and *fissilabris* at high magnification (greater than X14) fine short hairs are visible in some of the punctures of the elytra, usually on the outer rows, but for general purposes these species are considered glabrous.

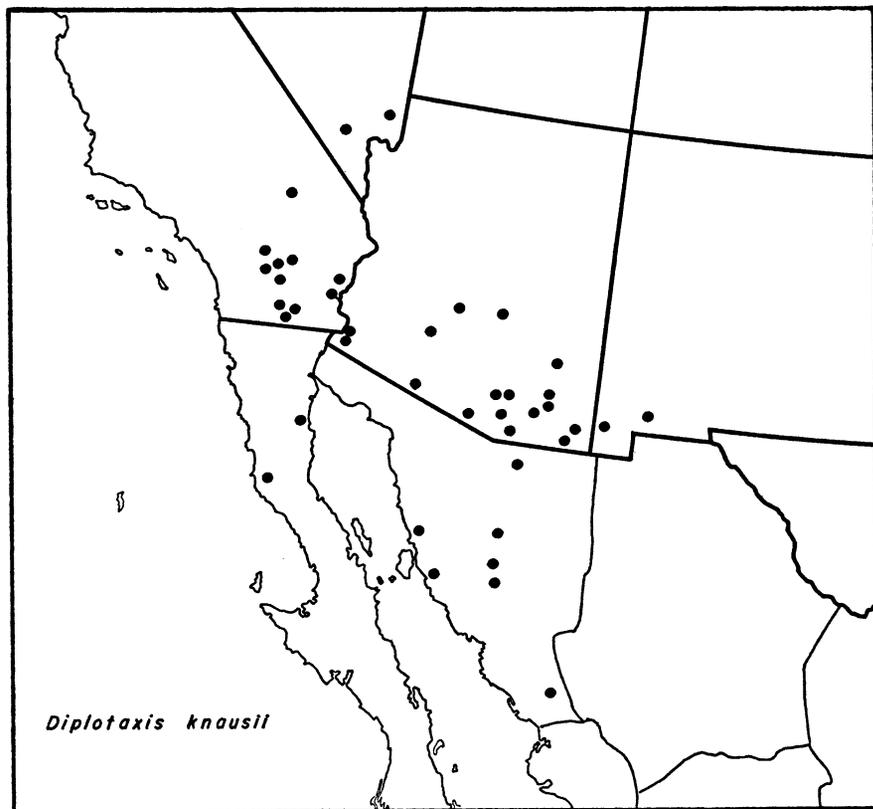


Fig. 47. Distribution of *Diplotaxis knausii*.

(*in litt.*), this species has been dug up at roots of mesquite in Sabino Canyon, Arizona, in July. Specimens collected by Butler and Werner at Organ Pipe Monument, Patagonia, San Bernardino, and Tucson, Arizona, were taken on mesquite (*Prosopis*). Specimens at Blythe, California, came to lights.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8 to 11 mm. Head with front deeply, triangularly impressed at middle behind clypeus. Clypeus one-half or more of the length of head, with a strongly transverse ridge between suture and front margin, the latter broadly abruptly reflexed, and very deeply emarginate between the rounded angles, punctures even denser than those on head, lateral margins not sinuate. Labrum bilobed, cut in two almost as deeply at middle as last segment of palpi is long. Mentum as deeply cleft in front as labrum, the declivity sharply V-shaped, its borders behind margined and pubescent.

Pronotum irregularly densely punctate but less densely than on head, often with impunctate areas at middle, usually with marked impression, sometimes two impressions or dimples on each side near front margin, sides evenly rounded to front and hind angles which are not produced. Scutellum with from three to 10 punctures at base or sides. Elytra with punctures a little larger than those on pronotum, dense, rugose; costae slightly convex but indistinct, their punctures rather dense, indistinct, and shallow, much smaller than those on intervals; second interval usually irregularly unipunctate, sometimes in two irregular rows of punctures; marginal hairs dense but very fine, alternating long and short hairs, some (usually in front) longer than both sutural intervals are wide.

Abdomen, one or more segments with slight or strong swellings or parallel rugae at, or on either side of, middle. Claws bent angularly and toothed subapically, the tooth

pressed close to the claw, much shorter than apex of claw and usually no wider. Genitalia as in figure 119.

SEXUAL DIMORPHISM: Male with first tarsal segment on front tarsi larger than second and larger than in female, also compressed, the outer edge knife-like, the apex markedly widened on outer side and bluntly prolonged; second segment elongate, also prolonged apically on outer side, and, seen from below, twisted, and carinate basally on outer side. Abdomen in male with paired tubercles on each side of middle or with transverse swellings across middle and with longitudinal rugae on or between the swellings, female abdomen occasionally nearly as in male, but usually only slight swelling is present on first segment. Fifth abdominal segment in male no shorter at middle than fourth, as in female. Some but not all males with inner edge of hind tibiae exceedingly densely hairy.

REMARKS: According to present knowledge, the geographical range of this species is wider than that of *fissilabris*, to which it is so closely related (see fig. 47). It also appears to be a more abundant species than *fissilabris*. In Arizona the two species have been collected in a number of the same localities: Gila Bend, Baboquivari Mountains, Patagonia, Robles Ranch in Pima County, Sabino Canyon in the Santa Catalina Mountains, San Carlos, Tucson, and no doubt in others. Both species are less common in Sonora; neither has been recorded previously from Mexico.

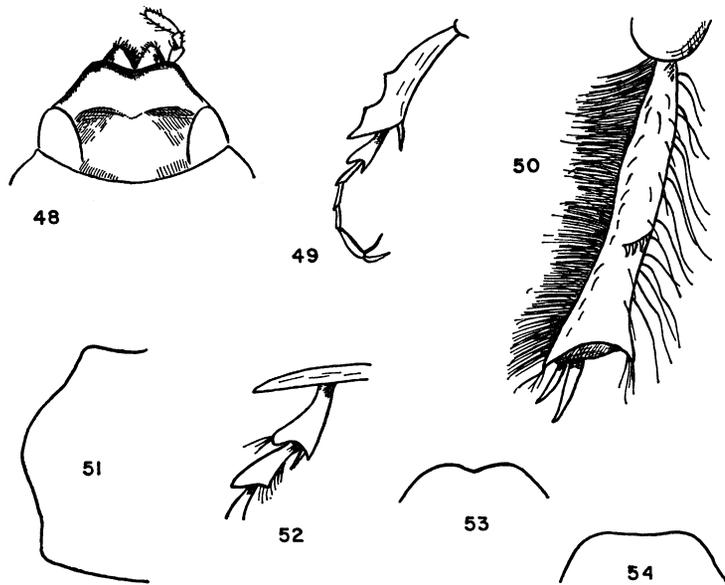
Although the labrum is always distinctly larger in *knausii* than in *fissilabris*, if only one species is available for comparison, it may be difficult to identify the species because of the variability in other characters (the comparison of the size of the labrum with the last palpal segment is not always reliable). These other characters are generally quite constant in specimens of *knausii* from the United States, but not in some specimens from Minas Nuevas, Sonora, and in a large series of 43, taken recently by Borys Malkin, from Desemboque (on the coast of Sonora just north of Tiburon Island), at the southern limits of the range of the species. In these, some individuals do not have the head deeply impressed, but scarcely so, as in *fissilabris*; some have the front margin of the

clypeus less sinuate or reflexed, the pronotal impressions less evident or lacking; and some have the front first tarsal segment in the male only slightly larger than the second (not nearly so large as shown in fig. 49). These populations approach *fissilabris*, and thus the two species are most distinct in Arizona where they are sympatric, while in Sonora where only one species (*knausii*) occurs (with the exception of a single specimen of *fissilabris*¹), the species are exceedingly similar and, as stated above, could be confused with each other. This appears to be an instance of character displacement, a speciation phenomenon of great interest which has been discussed recently by Brown and Wilson (1956).

There is a small but invariable character that has been found in the male which will always separate the two species concerned and will also distinguish *knausii* from all other species. In Sonora as well as in the north, males of *knausii* have the base of the second segment of the front tarsi furnished with a short carina on the outer side that evidently fits against the apex of the first segment which is also carinate (or more or less bent downward) at this point. When viewed from below, the second segment appears twisted at the point of emergence from the first segment. There is no such arrangement in other males of the group or in the females.

Some males of *knausii* have a dense fringe of yellow hairs on the inner side of the hind femora and tibiae, as in *anxius*, some *moerens*, and other species, but most males have these hairs not much more abundant than in the females. Specimens with these fringes were found in a series of about 30 from Organ Pipe National Monument, Quitobatito, Arizona; also in a male from Robles Ranch and one of several males from the Baboquivari Mountains. In *fissilabris* some males have quite hairy tibiae but never so hairy as in the *knausii* just mentioned. The genitalia of the two species are compared at the end of the remarks under *fissilabris*. The genitalia of *knausii* are very similar to those of both *moerens* and *anxius*.

¹ Despite intensive collecting in northern Sonora by several workers, including myself and my husband, this is the only specimen of *fissilabris*, from Pitiquito, so far known from Sonora.



FIGS. 48-54. The *moerens* and *brevidens* groups of *Diplotaxis*. 48. Head of *D. knausii*, showing bilobed labrum and terminal segment of maxillary palpi. 49. Right front tibia and tarsus of male of *D. knausii*, showing enlarged first segment. 50. Left hind tibia of male of *D. fossipalpa*, showing the hairs and exposed corbel. 51. Outline of left half of pronotum of *D. fossipalpa*. 52. First two segments of front tarsus of male of *D. aulacochela* (scale larger than others). 53. Outline of clypeus of members of *moerens* group. 54. Outline of clypeus of *brevidens* group.

Diplotaxis fissilabris Fall

Figure 120

Diplotaxis fissilabris FALL, 1909, p. 32 ("all specimens from Southern Arizona," here restricted to Tucson, Arizona, which is locality on type label; type, female, in Museum of Comparative Zoölogy).

DIAGNOSIS: The labrum is not so deeply bilobed as in the preceding species (*knausii*) but is about as in the two species that follow. All these forms are very similar. In *fissilabris*, the marginal hairs of the elytra are longer and denser than in *moerens* and the area near the clypeal suture is not flat. The smaller labrum, scarcely impressed front of the head, the non-elevated, non-reflexed center of the clypeal front margin, and the sexual differences in the front tarsi, abdomen, and genitalia distinguish this species from *knausii*. Minute hairs can be seen at high magnification in a few elytral punctures.

RANGE: Arizona, New Mexico, and from Sonora, Mexico (one specimen). A total of

200 specimens have been examined. (See Appendix for locality data.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8 to 11 mm. Head with front evenly rounded to clypeus or with slight impression at middle behind clypeus. Clypeus as in *knausii*, but transverse ridge in front of suture barely indicated by slight swelling, and front margin not so broadly or steeply reflexed, especially at center which is scarcely reflexed. Labrum bilobed, the lobes shorter than length of last palpal segment, therefore less deeply cleft than in *knausii*. Mentum as deeply cleft in front as labrum, the declivity deeply concave from side to side, its border margined, pubescent.

Pronotum as in *knausii* except front impressions lacking or not so noticeable. Scutellum usually impunctate, but sometimes with from three to five punctures. Elytra, claws, as in *knausii*. Genitalia as in figure 120.

SEXUAL DIMORPHISM: Male with front tarsal segments a little larger than those of

female, the first four compressed. Abdomen in male with second, third, and fourth segments at middle with longitudinal, parallel, short rugae; in female virtually smooth. Fifth abdominal segment in male no shorter at middle than fourth, as in female.

REMARKS: Although it may be difficult to distinguish females of this species from females of *aulacochela* and *moerens peninsularis*, none of these three forms is known to occur in the same region. Nominate *moerens* occurs with *fissilabris* in Arizona, but the labrum in this form of *moerens* is not truly bilobed, the mentum is not at all excavated in front, and the mental declivity is only shallowly concave.

The compression of the segments of the front tarsi in the male is as strong as that of the first segment of *knausii*, but in *fissilabris* there is no enlargement, the first two segments being equal in size and the following ones scarcely smaller. In *knausii* only the large first segment has a knife-like edge on the inner side, but in *fissilabris* all the segments are virtually knife-like when seen from the inner side. The hind tibiae are furnished with long hairs within, but these do not form a thick fringe as in some males of *knausii*. The hind femora are arcuate in the male, whereas males of *knausii* have the sides of the femora virtually parallel. The male genitalia differ somewhat, the outer side of the lobes in *fissilabris* being sinuate and arcuate to the apex which is rather bulbous dorsally, whereas in *knausii* the sides are virtually straight and the apices dorsally quite flat. The eighth sternite in *fissilabris* has almost parallel sides; it varies quite a bit in *knausii*. (See also under *knausii* for other remarks.)

***Diplotaxis aulacochela* Cazier**

Figures 52, 125

Diplotaxis aulacochela CAZIER, 1940a, p. 131 (Presidio, Texas; type in Texas Agricultural Experiment Station, College Station, Texas).

DIAGNOSIS: The only reliable difference between this species and *fissilabris* lies in the males which differ by having paired glabrous swellings on the second abdominal segment in *aulacochela* but transverse series of short longitudinal wrinkles in *fissilabris*; males also do not have the front tarsi compressed

as in *fissilabris*. So far as is known, their geographical ranges do not overlap. Differs from *moerens* principally by having the front of the head slightly impressed at middle and the clypeus slightly ridged transversely.

RANGE: Southwestern Texas and neighboring Chihuahua, northern Mexico. Only 30 specimens have been examined, nine males and nine females from 49 miles south of Chihuahua, Chihuahua, 4000 feet, July, 1952, and 12 specimens from the United States, from Castolon, from Hot Springs, and 58 miles south of Marathon, all in Brewster County, and from Presidio County, Texas.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8.5 to 10 mm. Head with front lightly impressed at middle behind clypeus, occasionally bi-impressed between eyes. Clypeus as in *knausii*, but transverse ridge and front margin not so abruptly elevated; the latter is also less deeply emarginate and less reflexed. Labrum bilobed, lobes shorter than length of last palpal segment, therefore less deeply cleft than in *knausii*. Mentum as deeply cleft in front as labrum, the declivity deeply concave from side to side, its border margined, pubescent.

Pronotum irregularly sparsely punctate, much more sparsely than head, often with impunctate areas at middle, one or two vague impressions on each side near middle or front; sides rather sinuate to front and hind angles which are not produced. Scutellum as in *knausii*. Elytra as in *knausii* except that usually the punctures are sparser and less rugose. Abdomen as in *knausii* but no rugae, and swellings less marked and usually confined to second segment. Claws as in *knausii*. Genitalia as in figure 125.

SEXUAL DIMORPHISM: Paired swellings on second segment of abdomen usually more prominent in male than in female, and fifth abdominal segment at middle shorter than fourth and shorter than in female.

REMARKS: In the type and only specimen of *aulacochela* (sex not given), the elytra were said to have the "surface smooth with punctures separated and no irregular impressions present." However, additional specimens show that this character, as well as the other differences given between this species and *fissilabris*, is not constant and

that the only external characters to distinguish these two species are those given above in the diagnosis. The male genitalia are also slightly different in the shape of the apical portion of the lateral lobes which are not bulbous in *aulacochela* (fig. 125) and of the eighth sternite which is acuminate and more narrowed in *aulacochela*, but this latter piece differs widely within some species. Fourteen males of *aulacochela* were dissected.

The fifth abdominal segment in males of this species, in contrast to both *fissilabris* and *knausii*, is a little shorter than in the female and shorter than the fourth segment, but it is not so noticeably shorter as it is in most males of the genus. The marginal hairs of the elytra are somewhat worn in most of the specimens examined and so appear short. Ten of the 30 specimens examined have the pronotum appearing black under a lighted microscope and the elytra appearing red, as described for the type. The first segment of the front tarsi in both sexes appears to be somewhat less truncate than usual, with a slight projection on the inner apex (fig. 52), but the presence of spines in this area usually obscures the outline. This segment is not compressed as in *fissilabris* males, nor is it enlarged or wider than the second segment as in males of *knausii*.

Diploptaxis moerens

DIAGNOSIS: This polytypic species is characterized in general by the unimpressed, uninterrupted, uniformly punctured surface of the head and clypeus, coupled with a strongly indented, sometimes bilobed labrum, and a flat, densely punctate pronotum with deeply furrowed side margins. In shape and punctuation it is most like *anxius* (which follows). It differs from *fissilabris* in the even surface of head and clypeus, in the short marginal hairs of the elytra, and in some male characters.

RANGE: Southwestern United States (Nevada, Utah, California, Arizona) south to the tip of Baja California, Mexico, also northern Sonora (see fig. 55).

HABITAT: See under the subspecies.

DESCRIPTION OF THE SPECIES: (See diagnostic description of group for characters omitted here). Length, 8 to 12 mm. Head

and clypeus presenting a uniform, unbroken, densely punctured surface without impressions. Clypeus about one-half of the length of head, margins scarcely or but narrowly reflexed, lateral margins not sinuate, anterior margin shallowly emarginate between the rounded angles. Labrum either strongly concave (nominate *moerens*) or bilobed (*moerens peninsularis*), not cut so deeply as last palpal segment is long. Mentum narrowly declivous in front, the declivity shallowly concave (*moerens*) or more deeply so (*peninsularis*), its hind border margined and pubescent.

Pronotum as in *knausii*, but occasionally punctures smaller than those on head, front impressions lacking, and sides usually with definite furrow from base to apex; scutellum as in *knausii*. Elytra as in *knausii*, but marginal hairs usually worn short and sparse. Abdomen as in *knausii*, except that the abdominal swellings are usually absent or obsolete. Claws less bent than in *knausii*, the tooth a little less apical and more outstanding. Genitalia as in figure 119.

SEXUAL DIMORPHISM: Some males have the hairs on the inner edge of the hind tibiae so dense as to present a golden fringe from base to apex. Fifth abdominal segment at middle shorter than fourth in male and shorter than in female.

REMARKS: This is by far the most abundant species of the group and the one with the widest geographical range. Examination of a large amount of material (over 1000 specimens from Mexico and the United States) shows that the two forms previously considered distinct species are conspecific. The nominate form, *moerens* (type locality, Vallecitas, California), occurs in Arizona, Utah, Nevada, and California, and about halfway south into the peninsula of Baja California; also at La Choya and Desemboque on the northern coast of Sonora. The form *peninsularis* (type locality, Santa Rosa, Baja California) is found in the south in the Cape region of the peninsula northward to about Concepcion Bay. In the northern form the labrum is broadly hollowed out at the center, bulbous at the sides, the declivity of the mentum only slightly concave from side to side, and the inner margin of the hind tibiae of the males is either scarcely

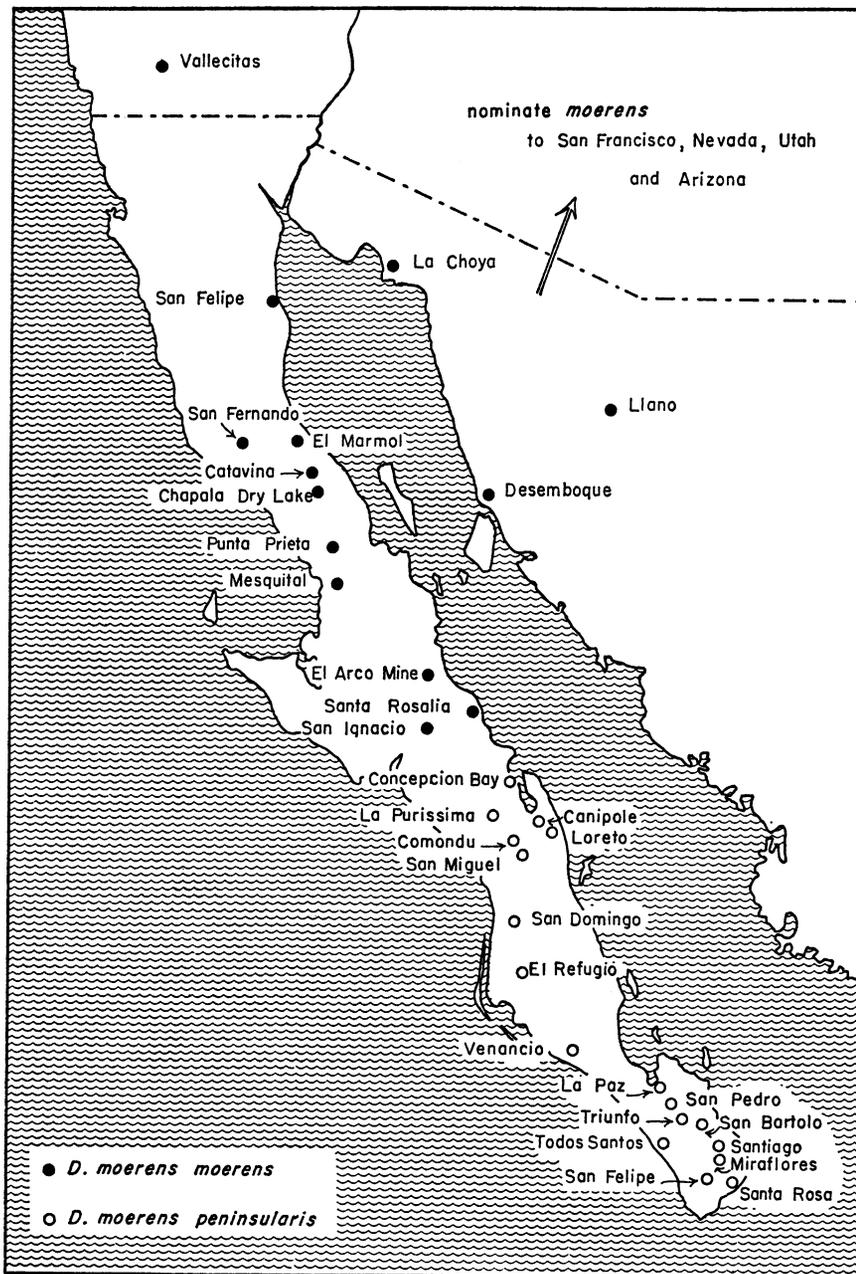


FIG. 55. Distribution of the subspecies of *D. moerens* in Baja California.

more hairy than in the females or densely fringed. In the southern form the labrum is rather abruptly and deeply cleft so as to appear more or less bilobed (about as in *fissilabris* and *aulacochela*), the mental declivity is cleft also, and the hind tibiae of the males are always so densely fringed

with golden hairs that one cannot see through them. In northern Baja California and occasionally in southern California, however, males of the northern form have the tibiae fringed as in the southern form, although sometimes less abundantly. The degree of indentation of labrum and mentum is a

more relative character, and many individuals have been seen throughout the range of both forms which cannot be placed with certainty in either form on the basis of this character alone. The lobes of the male genitalia appear nearly identical in both subspecies (fig. 119), dissections having been made of males from various localities; the eighth sternite was found to differ in shape individually, but not geographically. In some of the hairy species of the *puberula* group, the sternite varies also.

Other characters, either those mentioned in the literature or found on examination of material, apparently vary in both forms. These include whether the clypeal suture is impressed or not, whether the clypeus is strongly or feebly sinuate, the front of the head impressed slightly or not, whether the pronotum is widest at middle or base (it is never really wider at base, but appears to be), its punctures sparse or dense, its center with smooth space or not, the second elytral interval unipunctate or multipunctate, the abdominal segments swollen at the middle or not, the claws cleft nearer the middle or nearer the apex, the teeth of the front tibiae equidistant or not, and the pygidium with a center line of fused punctures or not. Fall, in his description, found *peninsularis* very similar to *moerens*; he considered the labrum the same in both forms, but found the shape of the pronotum "somewhat different."

The large series of over 400 specimens taken by Michelbacher and Ross on the 1938 expedition of the California Academy of Sciences to Baja California has been of great value in the interpretation of this species. Before this collection was made, I believe that *moerens* was not even known to occur south of the United States and that the only specimens known of *peninsularis* were those collected by Beyer in 1901 at Santa Rosa.

The presence or absence of tibial hairs in the males, mentioned above, is also often variable within other species. Thus males of *knausii* from three localities in Arizona have dense hairs, but not those from neighboring localities; and males of *blanchardi* Vaurie from Urbana, Illinois, have dense hairs, but not those from nearby. The apices of the lateral lobes of the male genitalia are more

narrowly acuminate in *moerens* and *anxius* than in the preceding species; they resemble those in *knausii*. *Diplotaxis moerens* differs from *anxius* in some male characters and in the unimpressed head.

***Diplotaxis moerens moerens* LeConte**

Figures 55, 119

Diplotaxis moerens LECONTE, 1856, p. 268 (Vallecitas, California [Vallecito, San Diego County, California]; two cotypes, females, in Museum of Comparative Zoölogy).

DIAGNOSIS: Differs from the southern form (*peninsularis*) by having the labrum deeply concave but not abruptly cleft or divided, the mentum scarcely concave, and the hind tibiae of the males not always abundantly hairy on the inner edge.

RANGE: Southwestern United States (California, Nevada, Utah, Arizona), south in Baja California to about Santa Rosalia, halfway down the peninsula, also at La Choya and Desemboque on the coast of Sonora (see fig. 55). Approximately 900 specimens have been examined (see Appendix for locality data).

HABITAT: A specimen from Organ Pipe National Monument, Arizona, was collected on *Larrea divaricata*.

REMARKS: There has been some doubt about the location of the type. No county is given by LeConte for his Vallecitas, but in his description of another species (*tenuis*) with the same locality, he gives San Diego County (1856, p. 271), which is in southwestern California. Fall, however, says that Vallecitas is in the "southeastern desert region of California" (1909, p. 61), meaning probably southwestern California or the southeastern part of San Diego County. Modern maps give no such locality, but older maps have "Vallecito" in the eastern part of San Diego County in the Vallecito Mountains, which is a desert region. This is probably correct. There is also a Vallecito in Calaveras County, at about the latitude of San Francisco, which is neither desert nor southern, and a Vallecitos (with an "s") just south of the border in Baja California. Another locality not on any map and from which we have specimens is Desemboque, a Seri Indian settlement on the coast of Sonora just north of Tiburon Island.

The hairy hind tibiae characteristic of the

southern subspecies are found also in most males of nominate *moerens* from Baja California, but not usually in males from the United States. Male *moerens* from San Felipe, Catavina, Chapala Dry Lake, Punta Prieta, Mesquital, San Ignacio, and Santa Rosalia in the northern part of Baja California (see map, fig. 55) have the tibiae as hairy as do males of *peninsularis* from southern Baja California; on the other hand male *moerens* from El Marmol and San Fernando, also from Desemboque, Sonora, have the tibiae much less hairy than those of *peninsularis*.

This subspecies should not be confused with *fissilabris*, *aulacochela*, or *knausii*, because those species have the labrum distinctly cleft, whereas nominate *moerens* has it merely deeply emarginate.

***Diplotaxis moerens peninsularis* Fall**

Figures 55, 119

Diplotaxis peninsularis FALL, 1909, p. 70, pl. 1 ["Santa Rosa, and San Felipe, Lower California (Beyer)," here restricted to Santa Rosa which is the locality on the type label; type, male, in Museum of Comparative Zoölogy].

DIAGNOSIS: Differs from the northern form (*moerens*) by having the labrum deeply, abruptly divided, the mentum more deeply concave from side to side, and the hind tibiae in the male always thickly fringed with golden hairs.

RANGE: Southern Baja California, Mexico, from the Cape region as far north as about Concepcion Bay (see fig. 55). A total of 227 specimens has been examined (see Appendix for locality data).

REMARKS: The San Felipe mentioned by Fall is not the better-known locality in the north on the Gulf of California, but a tiny place near Santa Rosa at the extreme tip of the peninsula. This can be assumed because Beyer, on his collecting trip in 1901, did not leave the Cape region, and Fall had Beyer's specimens. These same localities appear in Horn's description of *D. punctulata*.

A few individuals from El Refugio and Venancio on the western side of the peninsula seem to have characters of both subspecies. One of the two males from Venancio, and a single female, have a shallowly divided labrum as in nominate *moerens*, and one of them has the mentum also quite flat; one

male and one female from El Refugio (of a total of seven) show this same variation. All these males have very hairy hind tibiae as in *peninsularis*. Two of 28 males from San Domingo, north of El Refugio, have the tibiae somewhat less hairy than usual for *peninsularis*, and one of these also has the labrum less divided, as in nominate *moerens*.

Fall's type has the front of the head lightly bi-impressed, but very few of the 200 or more specimens examined have this character. Fall found that the claws were more apical in *peninsularis* than in *moerens*, but I find this difference too slight and too variable to have significance.

***Diplotaxis anxius* LeConte**

Figure 119

Orsonyx anxius LECONTE, 1856, p. 266 ("Valley of the Gila, Arizona"; type, male, in Museum of Comparative Zoölogy).

DIAGNOSIS: This is the only species of the group that has the head bi-impressed between the eyes, and it has the pronotum and elytra even more densely punctured than all the others. The male differs also from other males by having the front claws simple, not cleft, the tooth obsolete, or virtually so. No individuals have been seen with the second elytral interval unipunctate, as happens often in some of the species, but always crowded with punctures.

RANGE: Washington, California, southern Utah, and Arizona in the western United States. Specimens examined total 115. (See Appendix for locality data.)

HABITAT: Seven specimens from Laguna Dam, Arizona, were taken on the sweet pods of *Prosopis* or mesquite, commonly called "screw bean."

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8 to 11 mm. Head bi-impressed, usually strongly so. Clypeus nearly one-half of the length of head, slightly emarginate in front between the rounded angles, side margins not sinuate, front and side margins broadly, evenly reflexed throughout, surface with punctures as dense as those on head. Labrum strongly hollowed at center but not truly bilobed, usually shorter at middle than reflexed under side of clypeus. Mentum nearly flat, its declivity in apical fourth

shallowly concave, base of declivity margined and pubescent.

Pronotum exceedingly densely punctured, all punctures touching, at middle often with vague longitudinal depression or with depressions elsewhere, sides deeply furrowed, evenly rounded to rather acute front angles and to rounded hind angles. Scutellum usually impunctate or with a few basal punctures. Elytra nearly as densely punctured as pronotum, costae scarcely distinguishable from intervals, their punctures smaller and a little sparser, second interval multipunctate, marginal hairs short and sparse. Abdomen with paired glabrous swellings, often indistinct, and occasional rugae on second, sometimes on third, segment. Claws as in *knausii*. Genitalia as in figure 119.

SEXUAL DIMORPHISM: Male with hind tibiae densely fringed with golden hairs on inner edge, claws of front tarsi simple, that is, lacking the usual unguis, although sometimes a vestige of the tooth is present, claws longer than front claws of female. Fifth abdominal segment at middle shorter than fourth in male and shorter than in female.

REMARKS: LeConte erected the genus *Orsonyx* for the male of this species because of the unclawed front claws (he did not have a female, which has normal claws), but Fall (1909, p. 2) realized that this was not a good generic character, as males of a number of widely separated species have simple claws on front, middle, or on all legs (*mus*, *fossipalpa*, *rudis*).

Although this species does not have the labrum cleft as in the four preceding species, but deeply emarginate and virtually bilobed, much as in some *brevidens*, and *fossipalpa*, nevertheless it seems close to the preceding species in other characters, including the male genitalia. The males have the hind tibiae fringed within with dense yellow hairs as in some *moerens*. This species ranges farther north than any of the others of the group and is the only one not yet reported from Mexico.

SPECIES GROUP *brevidens*

The following species compose this group: *Diplotaxis brevidens* LeConte, *illustris* Fall, and *fossipalpa* Fall.

These are some of the largest species of the genus (up to 14 mm.) and are characterized by the fact that the males have long, abundant yellow hairs on the center of the abdomen, and on the inner sides of the femora and tibiae on at least two pairs of legs (fig. 50). The females lack the abdominal hairs, but they have, in two of the species, quite long but not so dense hairs on the legs, longer than in the females of most species. The pronotum and the pygidium are as large as in species of the *puberea* group. The labrum in one of the species (*fossipalpa*) is as broadly concave as in *anxius* of the *moerens* group, but it is not truly bilobed. The sixth abdominal segment is rather large (as long as half of the fifth segment) in two of the species and often exposed. The terminal segment of the maxillary palpi is notably depressed. The spur of the front tibiae appears shorter and narrower than in most other species and set farther forward.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Surface dorsally glabrous. Head and clypeus combined shorter than pronotum. Head without impressions, densely punctured. Clypeus without hairs, densely punctured, angles rounded, sides not sinuate. Eyes each about one-fifth of width of head. Antennae 10-segmented, club as long as funicle. Maxillary palpi with strong basal impression on last segment, as long as one-half or three-quarters of segment or longer. Mandibles not large. Scutellum usually impunctate or with from three to 12 punctures. Abdomen not ridged laterally, groove present above pygidium. Pygidium coarsely, rugosely punctured. Front tibiae tridentate, teeth about equidistant, third tooth about median. Middle tarsi with first two segments about equal in length. Claws gently rounded, not bent (fig. 5), tooth median in position, very short, standing out from claws, not closely appressed to it.

SEXUAL DIMORPHISM: Males with abdomen flattened (*brevidens*), strongly concave (*illustris*, *fossipalpa*), and with long golden hairs present inside the femora and tibiae on at least two pairs of legs. Fifth abdominal segment in male no shorter than fourth, as in female. First hind tarsal segment in male

often shorter than longer of the tibial spurs, as in female. Pygidium retracted in male, very large and nearly twice as wide as long. (See also table 3.)

KEY TO THE SPECIES OF THE *brevidens* GROUP

1. Metasternum with large shallow depression at center; pronotal sides abruptly bulging at middle, sinuate in front and rear (fig. 51); male with claws of middle tarsi simple, not toothed *fossipalpa*
Metasternum without marked depression but may be flattened; pronotal sides evenly rounded, scarcely, if at all, sinuate; male with middle claws toothed as usual 2
2. Size usually smaller; pronotum convex, shining; front of head abruptly descending to clypeus; claws with tooth distinctly median, often minute; male with abdominal hairs sparse, only slightly denser than other hairs; male with only scattered lateral hairs on front tarsi; male genitalia (fig. 125) not notched at apex *brevidens*
Size usually larger; pronotum flat, often opaque; front of head more horizontal, only gently sloping to clypeus; claws with tooth a little in front of middle; male with dense patch of abdominal hairs hiding surface of abdomen; male with dense fringe of hairs on sides of front tarsi; male genitalia notched at apex (fig. 121) *illustris*

DISCUSSION: This group was discussed at length and the species were compared in a recent paper (Vaurie, 1954, pp. 53-54). It has some affinities with the *moerens* group and might almost be placed there. These are species of southern California or Arizona in the southwestern United States that extend south into Sonora. About 300 specimens have been examined, most of them belonging to the species *fossipalpa*, of which Fall in 1909 had but two examples. The types of all the forms, including synonyms, have been examined.

***Diplotaxis brevidens* LeConte**

Figure 125

Diplotaxis brevidens LECONTE, 1856, p. 272 ("Valley of the Gila, Arizona" [southwestern Arizona]; type, female, in Museum of Comparative Zoölogy).

Diplotaxis laeviscutata MOSER, 1918, p. 313 (Mexico; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Most similar to *illustris* (which

follows), the females of the two species being scarcely distinguishable at first sight, but the claws are more distinctly median in *brevidens*, the tooth is smaller and at right angles to the claw, the pronotum is more convex, the clypeus is usually shorter and more reflexed in front, the second elytral interval distinctly unipunctate, not confused, and the size is generally smaller.

RANGE: Southern Arizona and Sonora, Mexico, including Tiburon Island in the Gulf of California. A total of 84 specimens was examined. (See Appendix.)

HABITAT: A single male on Tiburon Island came to a lighted sheet at night in a dry arroyo near the beach on the northern coast.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8 to 11 mm. Head either evenly rounded or abruptly declivous to clypeus. Clypeus about one-half of length of head, scarcely, if at all, emarginate in front, front and side margins broadly, evenly reflexed. Labrum flat in front, slightly concave behind, strongly, densely punctured; sides advanced, level with and no longer than reflexed under side of clypeus. Mentum flat, with short declivity indicated in apical fourth or fifth, its base margined and pubescent.

Pronotum very convex, punctures larger than those on head, but much sparser, occasionally faintly depressed at middle or with longitudinal impunctate space, rather sharply subangulate at middle, angles usually not acute. Elytra with punctures a little larger than those on pronotum, sometimes rugose, second interval usually unipunctate, sometimes irregularly so, costae not distinct, their punctures shallow and much smaller than on other intervals, marginal hairs nearly as long as scutellum, sparse (worn?). Genitalia as in figure 125.

SEXUAL DIMORPHISM: Male with the hairs on the center of the abdomen a little longer and denser than those on sides, female with all hairs short, inconspicuous. Some males have claw tooth on middle legs virtually obsolete. Front and hind tibiae and femora of male with long, very dense, yellow hairs on inner sides; these not present in female. Other sexual characters as in the group.

REMARKS: This is the smallest and least

hairy of the three species of the group and has the most convex pronotum. It appeared quite rare in collections until 1953 when Borys Malkin took a series of nearly 50 specimens in Desemboque, Sonora (this locality, which is a Seri Indian village, does not appear on any map that I have seen, but it is on the coast of Sonora opposite the northern tip of Tiburon Island). In this series, as well as in a series from Salome, Arizona, there is a much larger proportion of males, 40 males to six females from Desemboque, and eight males to three females from Salome. These individuals were collected in August, but in June also, from the Organ Pipe National Monument, Arizona, all of eight specimens collected were males. This species was taken along with *illustris* in Pitiquito, Sonora, and in Tucson, Arizona, and both it and *fossipalpa* occur in Phoenix, Arizona, and Desemboque, Sonora.

Fall (1909, p. 5) thought the last palpal segment was dilated in the male, as in *bowditchi* and *tarsalis*, but I cannot find that this is so. The male genitalia are about the same as in *aulacochela* (fig. 125), and lack the notched apices present in *illustris* and *fossipalpa*. Moser's *laeviscutata* was synonymized by me (1954) after examination of the type.

Diplotaxis illustris Fall

Figures 84, 121, 122

Diplotaxis illustris FALL, 1909, p. 58, pl. 1 (Baboquivaria [Baboquivari] Mountains, southeastern Arizona; type, male, in Museum of Comparative Zoölogy).

DIAGNOSIS: Generally larger than *brevicens*, the apex of the claw tooth not so strictly median as in that species but a little farther front, the pronotum flatter, the second elytral interval more often multipunctate than unipunctate. Similar also to *fossipalpa*, but differing in the absence of the metasternal depression, in the shape of the sides of the pronotum, and in some male characters.

RANGE: Arizona south into Sonora, Mexico. All but three of the 29 specimens examined are from the United States. (See Appendix.)

DESCRIPTION: (See diagnostic description of group for characters omitted here).

Length, 11 to 12.5 mm. Head and clypeus presenting a uniform, uninterrupted, densely punctured surface; clypeal suture often bent back angularly at middle. Clypeus at least one-half of length of head, often longer, slightly emarginate in front, front and side margins either evenly reflexed or the front edge less reflexed than sides. Labrum as in *brevicens*, but less concave. Mentum with declivity in apical third slightly concave, its base margined and pubescent.

Pronotum rather flat, punctures much sparser than on head, often with impunctate or depressed median space, rather sharply subangulate at middle, angles not acute. Elytra with punctures larger than those on pronotum, sometimes rugose, second interval usually confusedly punctate, seldom unipunctate, costae convex, with smaller punctures, marginal hairs as long as scutellum. Genitalia as in figures 121 and 122.

SEXUAL DIMORPHISM: Male with longitudinal patch of thick, long, golden hairs in center of abdomen, female with hairs normal. Front tarsi of male with long, sparse, lateral hairs emerging from outer, not under, sides of segments; females with no such hairs. Front and hind tibiae and femora in male as in *brevicens*, but hairs longer. Other sexual characters as in the group.

REMARKS: This species, reported here for the first time from Mexico, appears to be uncommon, but it may yet prove to be as abundant locally as *fossipalpa* and *brevicens* under the right conditions, whatever they may be. As found true of *brevicens*, the majority of the specimens examined are males (17 of 29), whereas in *fossipalpa* the reverse is true.

In spite of the differences listed in the diagnosis above between this species and *brevicens*, these two species are both subject to much individual variation in the characters mentioned, and it is often difficult to identify females (the males have distinctive genitalia and other characters). The male characters are more similar to those of *fossipalpa*, the hind tibiae, femora, and abdomen being very hairy, the hind tibiae also appearing somewhat concave or bent before apex on the inner side, and the corbels tending to be slightly but not noticeably exposed.

The male genitalia have slightly deflexed

truncated notches at the apex of the lateral lobes, which I have seen elsewhere in the genus only in *fossipalpa*, but in that species the notches are strongly bent down underneath so that they are not visible from above. In these species, but to a much lesser extent in *brevidens*, the lobes near the apex on the under side have an elongated patch of abundant, short, yellow hairs. The eighth sternite (figs. 84, 85) is pointed at the apex as in *brevidens*, not emarginate-truncate as in *fossipalpa*.

Diplotaxis fossipalpa Fall

Figures 50, 51, 85, 123, 124

Diplotaxis fossipalpa FALL, 1909, p. 57, pl. 1 (Phoenix, Arizona; type, female, in Museum of Comparative Zoölogy).

Diplotaxis villosipes FALL, 1932, p. 193 (Holtville, California; type, male, in Museum of Comparative Zoölogy).

DIAGNOSIS: Most spectacular of all the genus, and also one of the largest, this species is characterized by having extremely sinuate pronotal sides (fig. 51), strongly concave metasternum, and in the male tremendously long fringes of golden hair on the abdomen, femora, tibiae, trochanters, and pronotal and elytral margins, and the claws of the middle tarsi simple, not cleft. The leg hairs are equally long in females, but sparse, not dense.

RANGE: Southern Arizona and southern California south into Sonora, Mexico. A total of 282 specimens was examined. (See Appendix for locality data.)

HABITAT: A large series collected by C. and M. Cazier were taken at lights at Playa Hermosa, just north of Rocky Point [Puerto Peñasco] on the coast of northern Sonora, Mexico.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 10 to 14 mm. Head evenly rounded or abruptly declivous to clypeus. Clypeus nearly as long as head, scarcely emarginate in front, front and side margins either evenly reflexed or front less reflexed than sides. Labrum deeply concave but not bilobed, strongly, densely punctured, sides advanced, level with and same length as, or a trifle longer than, reflexed under side of clypeus. Mentum as in *brevidens*.

Pronotum with punctures of same size as those on head, but sparser, often with impunctate space at center and with sides impressed broadly in front, sides prominently bulging at middle, thence sinuate and constricted to front and hind angles which are not acute. Elytra as in *brevidens*, but punctures usually not larger than those on pronotum and marginal hairs as long as scutellum. Metasternum with round or elongate depression between middle and hind coxae. Genitalia as in figures 123 and 124.

SEXUAL DIMORPHISM: Male with claws of middle tarsi simple, not cleft, the unguis obsolete, or nearly so, and corbels of hind tibiae exposed (fig. 50). Male with longitudinal patch of thick, long, golden hairs on middle of abdomen. All tibiae and femora in male abundantly, densely hairy within and with sparse but also very long hairs on outer side (fig. 50); females have long sparse hairs on outer side of hind tibiae also (longer than tibiae are wide), but no dense hairs within. Male front tarsi with long, sparse, lateral hairs. Other sexual characters as in the group.

REMARKS: Although the metasternum, pronotal sides, labrum, and male genitalia differ, this species and *illustris* appear very similar at first sight and are no doubt closely related, as mentioned by Fall (1932). I have not yet seen them from the same localities, although both have been taken in the states of Arizona and Sonora. Most of the places where *fossipalpa* has been found are desert-like, whereas *illustris* seems more common in mountainous areas. Fall, indeed, mentioned in 1909 the possibility that *fossipalpa* was the female of *illustris*; this was before he had seen the male of *fossipalpa*, which he called *villosipes* (synonymized by Vaurie, 1954, p. 53).

The hairs are always much thicker in *fossipalpa* than in *illustris* and are present on the middle femora and tibiae as well as on the other legs (in *illustris* they are on front and hind legs only). The lobes of the male genitalia of *fossipalpa* are very short and stubby for so large a beetle, and are much shorter than the basal piece; the apices are strongly curled down and under (fig. 124), with a hollow space beneath and a transverse carina on each side. If the truncate apices of

illustris were also deflexed in the same manner, they would probably resemble those of *fossipalpa*. The eighth sternite (fig. 85) is also distinctive.

A male from Holtville, California, the type locality of *villosipes*, has the palpal depression very deep and trough-like, extending almost from base to apex of the segment, somewhat as in *Liogenys palpalis* from Chile, and also as in the type of *villosipes*. A female from the same series has the segment on one side as just described, but the segment on the other side only shallowly depressed. There seem to be no other differences between these two specimens and others. Two males from Rancho Mirage, California, have vestiges of the unguis on the ordinarily toothless middle claws, and a male from Puerto Peñasco, Sonora, lacks the tooth of the outer claw on the usually toothed front claws. In the Puerto Peñasco series of 200 specimens, many individuals have dark, almost black, palpi, and one or two have the antennal club also dark, this latter a character generally present only in the tiny *aenea*, *corrosa*, and *clypeata*.

In contrast to the findings with the two preceding species, in *fossipalpa* the material at hand is composed of more females (173) than males (109). More knowledge of the habits of these scarabs may eventually clarify these discrepancies in the sex ratios of different species. Thus recently someone has reported that the males and females of some species fly at different levels, so that more of one sex or the other were taken in light traps set at different heights.

SPECIES GROUP *cribulosa*

The following species comprise this group: *Diploaxis cribulosa* LeConte (polytypic); *obregon*, new species; and *mimosae* Fall.

The members of this group seem to fall between the *moerens* and *puberula* groups, having the bilobed labrum of most of the species of the former and the dorsal pubescence and clypeus of many species of the latter.

The group is characterized by having a distinctly cleft or bilobed labrum, hairy vestiture dorsally, the sides of the abdomen at least partially ridged, a more or less trapezoid clypeus, with sharp front angles, and the claws cleft subapically. Two of the

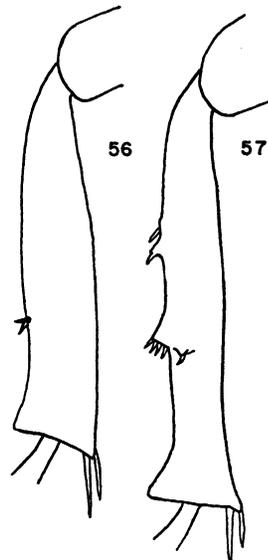
species (*mimosae* and *obregon*) are apparently quite restricted in their geographic range, the first to Arizona and Sonora, the second to Sonora. The third species, on the other hand, is one of the widest ranging of the genus, occurring in three southwestern states of the United States as well as in six states of Mexico. The only other distinctly hairy species with the labrum cleft are the small *rudis* and *rex*, neither of which has the abdomen ridged or the clypeus angulate.

Over a thousand specimens have been examined, including the types of *cribulosa* and *mimosae*, most of the material belonging to *cribulosa*. Many of these were taken on the 1947 David Rockefeller Mexican expedition of the American Museum of Natural History.

All the diagnostic characters of the group are given under *cribulosa*, with which the other species are compared.

KEY TO THE SPECIES OF THE *cribulosa* GROUP

- Hind tibiae scarcely constricted before apex and tibial carina with only two spines (fig. 56), carinae of middle and hind tibiae not extending across face of tibiae; Sonora, Mexico *obregon*
Hind tibiae strongly constricted before apex and tibial carina with from four to six spines



FIGS. 56, 57. The *cribulosa* species group. 56. Right hind tibia of *D. obregon*, type, showing obsolete carina of two spines. 57. Right hind tibia of *D. cribulosa sinaloa*, type; characteristic also of *D. c. cribulosa* and *D. mimosae*.

- (fig. 57), carinae of middle and hind tibiae extending at least halfway across face of tibiae 2
2. Elytra with dorsal hairs short, no longer than space between the punctures along the striae; Sinaloa, Mexico *cribulosa sinaloa*
Elytra with dorsal hairs long and wispy, at least twice as long as space between the punctures 3
3. Abdomen with an entire, elevated, distinct, chitinous ridge laterally at junction of elytral margin; small, black; Arizona, Sonora *mimosae*
Abdomen with only a faint weak ridge laterally, the ridge not extending farther than the first three segments, occasionally to the fourth; United States and Mexico. *cribulosa cribulosa*

Diplotaxis cribulosa

DIAGNOSIS: Hairs long or short, equal in length, absent from striae punctures, abdomen partly ridged. This polytypic species differs from the other two species of the group by having the abdomen only partially and weakly, not entirely and strongly, ridged; it differs further from *mimosae*, with which it is sympatric in Arizona, in the more concave mentum, less rugosely punctured pronotum, and generally larger size; differs from *obregon* in the hind tibiae (figs. 56, 57).

RANGE: Southwestern United States and northwestern Mexico, except Baja California, south to the states of Durango and Jalisco, mostly in the highlands but also along the coast of western Mexico. The total number of specimens examined is a little over 1500. (See Appendix for locality data; see fig. 58.)

HABITAT: See under the subspecies.

DESCRIPTION OF THE SPECIES: Length, 7 to 11 mm. Color, dark red, brown, or piceous. Head hairy, evenly rounded to clypeus, head and clypeus equally densely regularly punctured and hairy, head sometimes rugose; clypeal suture usually obliterated by punctures. Clypeus hairy, about one-half of length of head, side margins either sinuate or almost straight, front margin variable in shape, either truncate between dentiform angles or emarginate between obtuse angles, front margin reflexed, sometimes side margins also. Eyes moderate-sized to small, each about one-fifth or one-sixth of width of head. Antennae 10-segmented, club same

length as funicular segments. Maxillary palpi with last segment flattened at base. Mandibles not large. Labrum bilobed, cleft in two, the lobes hairy at apex and much advanced beyond level of under side of clypeus, but not so deep as last segment of palpi is long. Mentum concave in front, almost cleft, declivity at anterior third concave from side to side, its base arcuate, margined, and pubescent.

Pronotum with yellow erect hairs, sometimes as long as antennal club (nominate *cribulosa*), sometimes shorter (*cribulosa sinaloa*), punctures sparser than those on head, but of about same size, sides rather strongly arched, widest part behind middle, front angles sometimes slightly acute, sides strongly margined, often crenate, base more or less depressed, also punctured and margined; scutellum usually entirely punctured. Elytra with long or short erect hairs as on pronotum, hairs emerging from punctures of intervals, not of striae; punctures of same size as on pronotum but very dense, virtually touching; second interval multipunctate; costae flat, with slightly smaller punctures, but not well differentiated from intervals; marginal hairs very long, some, especially towards the front, almost twice as long as scutellum is wide at base.

Abdomen at sides with strong or weak chitinous ridge on segments 1 through 3, occasional on segment 4, or on segments 1 and 2 only; fifth segment without groove or ridge above pygidium. Pygidium with uniform dense punctures of same size as those on sides of abdomen. Front tibiae with the three outer teeth widely spaced, basal tooth submedian. Middle tarsi with first segment slightly longer than second. Claws bent and toothed subapically, tooth nearly same length as claw and wider (fig. 7). Femora, tibiae, abdomen, and pygidium with long, fine, erect hairs as on dorsal surface. Genitalia as in figures 127 and 128.

SEXUAL DIMORPHISM: Pygidium more transverse in male, retracted because of shortness of fifth abdominal segment at middle. Hind femora and hind tibial spurs no narrower in male than in female. First tarsal segment on hind legs scarcely if at all shorter than longer spur in male, shorter and wider in female. These differences are not always clear cut

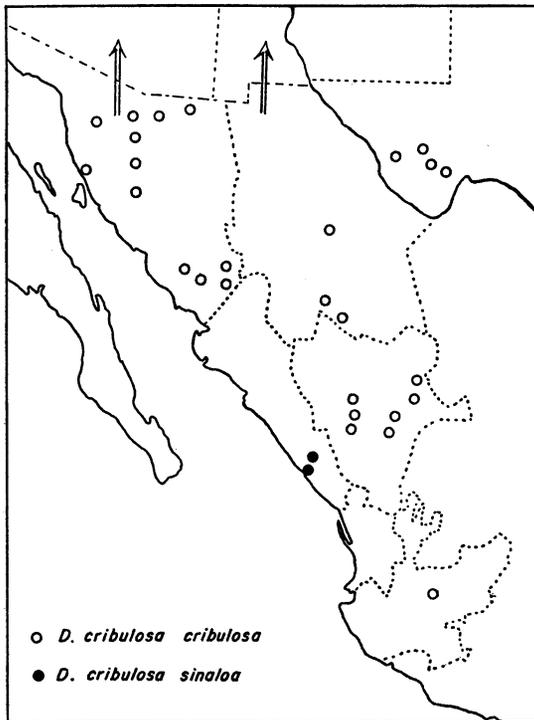


FIG. 58. Distribution of the subspecies of *D. cribulosa*.

in this group, and the sexes are not always easy to distinguish.

REMARKS: This well-known and widespread species is separable into two subspecies: *cribulosa* (type locality, Frontera, New Mexico) extending over most of the range of the species from Arizona to Jalisco, except where *sinaloa* (type locality, Mazatlan, Sinaloa), is confined to the coastal strip in the state of Sinaloa (fig. 58). The nominate form has very long dorsal hairs, those on the elytra being as long as two or three times the distance between the punctures, and is generally light red-brown or tawny in color; *sinaloa* has uniformly shorter hairs, about half of the length of those in nominate *cribulosa*, and is almost always black or piceous in color. The male genitalia of the nominate form are narrower, smaller, and have the apices of the lateral lobes not noticeably enlarged, whereas in *sinaloa* the apices are rather bulbously and abruptly enlarged and the base is broader. Long-haired but dark specimens from southern Sonora, which have been assigned to the nominate form, have genitalia that agree

sometimes with those of one form, sometimes with those of the other. If it were not for these southern Sonora specimens, *sinaloa* might be considered a distinct species, and it may well prove later to be so. However, long- and short-haired individuals occur in other species, although not as geographic forms, such as *sordida* Say from the United States, *poropyge* Bates from Central America, and *puncticollis* Moser from Mexico and Guatemala. These species, as does *cribulosa*, have certain distinctive characters that make it improbable for each of them to be split into two species merely on the basis of the length of the dorsal pubescence. The arrangement of the pubescence, on the other hand, appears diagnostic for the species, that is, whether hairs are present or not in certain punctures of the elytra. Nominate *cribulosa* is mainly a highland form, but occurs on the coast at Desemboque, Sonora, just north of Tiburon Island, and inland at Hermosillo, which is also at low elevation (about 600 feet).

This abundant beetle varies greatly in size, there being a 5-mm. difference between the smallest and largest individual. Although it was thought that there might be a large form from the vicinity of Phoenix, Arizona (Cazier, 1940b), the variability of size throughout the range of the species and the fact that large individuals occur elsewhere seem to preclude this possibility.

The lateral ridge of the abdomen is usually a sharpened edge between the ventral and dorsal areas and not an actual raised ridge as it is in *mimosae*, but sometimes it is raised in part, as in three of the 100 specimens from Carr Canyon, Arizona. In one locality it may be either weak or strong and extend either to the first three segments or to the fourth also. The clypeus usually has its sides rather sinuate, but they are often straight; likewise the front margin varies from truncate to emarginate, with the angles either bluntly rounded or dentiform, prominent or not prominent. The hind tibiae have the spinose carina always prominent and with five or six spines; there are also two additional spines above these, but one or both may be lacking; the apex of the hind tibiae is widely flared, the tibiae constricted before the apex.

Although Fall and other authors have used

the emended name *cribrulosa*, I use the spelling in the original description, without the second "r."

***Diplotaxis cribrulosa cribrulosa* LeConte**

Figures 57, 58, 127

Diplotaxis cribrulosa LECONTE, 1856, p. 270 (Frontera, Rio Grande [New Mexico]; type, male, in Museum of Comparative Zoölogy).

Diplotaxis popino CASEY, 1885 (1884-1885), p. 179 (Arizona; type in United States National Museum).

DIAGNOSIS: Differs from the coastal subspecies from Sinaloa by having the dorsal hairs longer, about twice as long as in that form, and the male genitalia of a different shape (figs. 127, 128). It is also generally lighter in color, more red-brown than black, although specimens from southern Sonora are as dark as those from Sinaloa.

RANGE: Arizona, New Mexico, and western Texas south through the states of Sonora, Chihuahua, Durango, to Jalisco, excluding Sinaloa and Nayarit. For locality data on the 1355 specimens examined, see Appendix.

HABITAT: Some specimens from Phoenix, Arizona, were taken on "peach foliage," others on mesquite (*Prosopis juliflora*) in Patagonia; on walnut (*Juglans*) at Sycamore Canyon, Ruby, and on *Gutierrezia lucida* in Willcox. Two specimens from San Juan del Rio in Durango were picked from *Baccharis glutinosa*. It is not known whether the beetles were feeding on the plants named. Some Arizona specimens taken by Werner, Nutting, and Butler came from areas of mesquite chaparral, from oak-juniper associations, from desert grassland, sycamore-oak-ash, sycamore-willow, and mesquite-oak associations.

REMARKS: In Sonora this form, as also the form *sinaloa*, occurs on the coast, but in most of its range in occurs on the plateau inland. Only one individual has been seen from as far south as Jalisco; it is from Guadalajara, is light in color, with long hairs, and is typically the nominate form.

I have not seen Casey's type of *popino* (type locality, Arizona), a form that was synonymized by Cazier (1940b). The type is in the United States National Museum, but there is another supposed type in the Museum of Comparative Zoölogy, mentioned by Fall (1909, p. 23). This specimen is

marked "*popino* type," in Casey's handwriting, but I have examined it, and it is, as Fall also says, a specimen of another species (*mimosae*) which may have become mixed in Casey's series of *popino*. Possibly Casey may have meant "type" in the sense of "like *popino*."

***Diplotaxis cribrulosa sinaloa* Vaurie,**
new subspecies

Figures 57, 58, 128

TYPE MATERIAL: Type, male, Mazatlan, Sinaloa, Mexico, August 2, 1953, David Rockefeller Mexican expedition, C. and P. Vaurie, collectors, in the American Museum of Natural History. Twenty-five paratypes, same data, and 40 additional paratypes from: Mazatlan, July 21, 1955 (R. B. and J. M. Selander); July 17, 1955 (Paul Opler); June 27, 1956 (R. and K. Dreisbach); August, 1914, and September, 1917 (Kusche); Venedio or Venodio [El Venadillo], June, August, 1914, 1915 (J. A. Kusche). Some paratypes deposited in the collections of the Instituto de Biología, University of Mexico; California Academy of Sciences; United States National Museum; Illinois Natural History Survey Division; Richard B. Selander; R. R. Dreisbach; and Zoologisches Museum, Berlin.

DIAGNOSIS: Differs from nominate *cribrulosa* by having short, not long, dorsal hairs, those on the elytra being scarcely longer than the space between the punctures, and different male genitalia (figs. 127, 128). The marginal hairs of the elytra are as long as in *c. cribrulosa*. The color is usually darker than in that subspecies.

RANGE: State of Sinaloa on coast of northwestern Mexico (see fig. 58).

HABITAT: The type and paratypes that were collected by C. and P. Vaurie came at night to a Coleman lantern on the sandy, muddy shore of a lagoon behind the ocean front in Mazatlan, in the vicinity of some bushes and trees.

REMARKS: It is possible that this form, because of its constant short hairs, is a distinct species, but it is here considered a subspecies because of the similarity of the male genitalia with those of some specimens of nominate *cribrulosa* from southern Sonora. Other significant characters, such as the labrum, the mentum, and the apically widened hind tibiae with their full ring of

spines (fig. 57), are similar in both forms. Even the abdominal ridge shows the same kind of variation, being weakly indicated in some specimens of both forms, and extending farther than the first three segments in other specimens.

The Kusche material from Venedio is actually from El Venadillo, near Mazatlan, according to a study by Irving J. Cantrall (*in* Boyle, 1956, p. 153). About 45 or 50 additional specimens from Mazatlan have been examined.

***Diplotaxis obregon* Vaurie, new species**

Figures 56, 126

TYPE MATERIAL: Type, male, Obregon, Sonora, Mexico, July 29, 1952, C. and P. Vaurie, collectors, in the American Museum of Natural History.

DIAGNOSIS: Hairs short, of equal length, absent from striae punctures, abdomen ridged. This species has the same strongly chitinous, elevated abdominal ridge as *mimosae* and the very short dorsal hairs of *cribulosa sinaloa*, but the middle and hind tibiae (fig. 56) differ by being not or scarcely constricted before the apex and having inconspicuous carinae of only two spines on the outer edge. The sides of the pronotum are more evenly rounded, not bulging abruptly at middle.

RANGE: Known only from the type, Obregon, southern Sonora, in northwestern Mexico.

HABITAT: The type was collected at lights in the city of Obregon which is situated in low-lying land at present under intensive irrigation from the Yaqui and Mayo rivers and fast becoming a rich agricultural region.

DESCRIPTION OF TYPE, MALE: Color, piceous. Length, 9 mm. Head evenly rounded to clypeus, more rugose than actually punctured. Clypeus hairy, almost as long as head, with dense punctures as on the head but less rugose, side margins sinuate, front margin distinctly emarginate between dentiform acute angles, margin reflexed. Each eye almost one-quarter of width of head. Antennae, palpi, mandibles, labrum, and mentum as in *cribulosa*, except that mentum has a shorter declivity, in anterior fourth, not third.

Pronotum as in *cribulosa*, except that hairs are shorter than antennal club and sides are

only gently, not strongly, arched; scutellum densely punctured in basal half. Elytra with short hairs as on pronotum, present in interval punctures, not striae; punctures denser than on pronotum; second interval multipunctate; costae flat, scarcely differentiated from intervals; marginal hairs no longer than dorsal ones.

Abdomen at sides with strong longitudinal ridge extending to the spiracles, fifth segment without groove above pygidium. Pygidium, front tibiae, middle tarsi, and claws as in *cribulosa*, but basal tooth of front tibiae is worn. Genitalia as in figure 126.

SEXUAL DIMORPHISM: No female has been seen, but the male has the first segment of the hind tibiae the same length as the longer of the tibial spurs, and the pygidium not noticeably transverse, scarcely retracted.

REMARKS: This species differs from the others in the group in a combination of short dorsal hairs, entirely ridged abdomen, and different hind tibiae and male genitalia (figs. 56, 126). The last two characters are the only ones by which it differs absolutely, because the short dorsal hairs are present also in *cribulosa sinaloa*, and the entirely ridged abdomen occurs in *mimosae*. Although the species occurs within the range of *c. cribulosa* in Sonora, it is less similar to that form than it is to *c. sinaloa* to the south.

It may be unwise to describe this species on a single specimen, in view of the fact that the length of the hairs, the ridge on the abdomen, and the shape of the hind tibiae are not completely reliable in the genus, nor are they specifically constant in this group. However, unless additional specimens of *obregon* should prove to vary in more than two of the characters cited, they would still be separable from the other species. Thus *cribulosa* has a short- and a long-haired subspecies, but no individuals have been seen with the abdomen entirely and strongly ridged, and all specimens of *mimosae* have the abdomen ridged as in *obregon*, but the dorsal hairs are always very long. Even if both these characters should be variable in *obregon*, there are still the tibiae that are scarcely carinate at the middle and scarcely constricted before the apex, whereas in the other species the carination is abrupt and extends across the face of the tibiae, and there

are four to six, not two, spines emerging. Forty-eight specimens of *c. cribulosa* also from Sonora have distinctly carinate hind tibiae, not at all like those of *obregon*. The male genitalia are of the same general form, but the lobes in *obregon* are not joined so near the base, and the apices are not bulbous.

In two other hairy species (*puberea* and *poropyge*) the sides of the abdomen are weakly ridged in a few individuals in the former, although the species is not supposed to have a ridge, and the sides are not ridged in some of the latter, in which the species as a whole has a ridge. The length of the dorsal hairs also varies within some species, as in *puncticollis* and *sordida*.

Diplotaxis mimosae Fall

Figures 57, 127

Diplotaxis mimosae FALL, 1909, p. 22, pl. 1 ("Southeastern Arizona," the type is from Santa Rita Mountains, Arizona; type, female, in Museum of Comparative Zoölogy).

DIAGNOSIS: Hairs long, of equal length, absent from strial punctures; abdomen ridged. Very similar to *cribulosa*, but smaller (7 to 8.5 mm.) and almost invariably black, differing further by having the pronotum densely, rugosely punctured, not sparsely, and the ridge on the sides of the abdomen unmistakably strong, extending to the last segment, not just part way. In the latter character it is similar to *obregon* from southern Sonora, but differs from that species by having very long dorsal hairs and more spines on the hind tibiae. The male genitalia are longer in *mimosae* than in *cribulosa* but of approximately the same shape (fig. 127).

RANGE: Southern Arizona, mostly in the mountains, and northern Sonora. A total of 185 specimens has been examined. (See Appendix for locality data.)

HABITAT: In the Arizona mountains where this species is apparently restricted, it has occurred, according to Fall (1909) on "*Mimosa* sp." in the Santa Rita Mountains; a specimen examined from Mt. Lemmon in the Santa Catalina Mountains is labeled "ex juniper," and three individuals from Molina Basin, Mt. Lemmon, are labeled "on bear grass."

DESCRIPTION: Color, black. Length, 7 to

8.5 mm. Head, clypeus, eyes, antennae, palpi, mandibles, and labrum as in *cribulosa*. Mentum only slightly concave in front, anterior declivity vaguely indicated by basal setae. Pronotum with long, yellow, erect hairs at least as long as antennal club, punctures dense, rugose, sides strongly subangulate behind middle, thence constricted and slightly sinuate to hind angles, and rounded to front angles which are acute; sides strongly margined, margins crenate; base depressed, especially laterally, also punctured and margined. Scutellum, elytra as in *cribulosa*. Abdomen with very strong, raised, chitinous ridge or carina extending from first segment to the spiracles of fifth segment, fifth segment in some individuals with indistinct groove above pygidium. Pygidium, front tibiae, middle tarsi, claws, and male genitalia (fig. 127) as in *c. cribulosa*.

SEXUAL DIMORPHISM: As in *cribulosa*.

REMARKS: This species and *cribulosa* occur together in many of the same places in Arizona, the latter, however, occurring also widely elsewhere. The majority of examples of *mimosae* examined come from a large series taken in Carr Canyon, Huachuca Mountains, in June, 1952, by Cazier, Gertsch, and Schrammel; in August of the same year these collectors took an equally large series of *cribulosa* in the same locality. It is interesting that each series contains specimens of only one of the species, which would seem to mean that *cribulosa* emerges later in the season; however, I have earlier and later records for both species from other localities.

SPECIES GROUP *rugosifrons*

Diplotaxis rugosifrons Moser

Figure 59

Diplotaxis rugosifrons MOSER, 1918, p. 301 (Tepic, Nayarit, Mexico; type, female, in Zoologisches Museum, Berlin).

DIAGNOSIS: Hairs short, equal in length, absent from strial punctures of elytra, abdomen ridged. Differs from species of the *puberula* and *pilipennis* groups by having the front angles of the pronotum markedly drawn forward and acute, and the head with a frontal ridge extending slightly over the eyes. The punctures of the elytral costae, as is true also of some members of the *puberula*

group, are as large and dense as the other punctures of the elytra.

RANGE: Known only from Tepic in the state of Nayarit, northwestern coastal Mexico. Six females, including the type, and one male have been examined.

HABITAT: All the specimens, except the type, were collected from vegetation in a weedy field at night, July, 1953, by P. and C. Vaurie.

DESCRIPTION: Length, 8 to 9 mm. Color, dark red. Head scarcely hairy (worn?), densely, confluent punctured, ridged behind clypeus (ridge usually pronounced and extending over eyes, but rather weak in type). Clypeus hairy, narrowed in front, more than one-half of length of head, with same kind of punctures as on the head, front margin slightly emarginate or nearly straight, broadly reflexed, angles rounded or bluntly dentiform, side margins sinuate. Each eye one-quarter or one-fifth of width of head. Antennae 10-segmented. Mandibles small. Maxillary palpi with flattened dorsal area at base of last segment. Labrum hollowed at center, the sides rather prominently advanced, densely punctured, no longer medially than reflexed under side of clypeus. Mentum nearly flat, the declivity in anterior fourth scarcely declivous, only weakly margined posteriorly, but arcuate and pubescent.

Pronotum with short hairs, large, convex, densely punctured (one specimen is sparsely punctured) with punctures of same size as those on head, sides strongly margined, arcuate behind middle, thence sinuate to acute and produced front angles, base punctured as usual. Scutellum densely punctured. Elytra with hairs a little longer than distance between punctures, absent from striae, punctures dense, coarse, second interval multipunctate, costae scarcely evident because of their large, coarse punctures, marginal hairs about twice as long as dorsal hairs.

Abdomen with strongly elevated chitinous ridge laterally, extending to spiracles, fifth segment with long but very shallow groove above pygidium. Pygidium densely punctured. Front tibiae worn on all specimens examined, but basal tooth evidently a little in front of middle (nearly obsolete in some specimens). Claws angulate medially, bent abruptly, cleft subapically, tooth almost as



FIG. 59. *Diplotaxis rugosifrons*, three-quarter view of head and pronotum.

long as apex of claw, and thicker.

SEXUAL DIMORPHISM: Hind tibial spurs in female scarcely thicker than in male. Shape of pygidium about the same in both sexes. First hind tarsal segment longer in male than in female. Hind tibiae with same apical flare in both sexes.

REMARKS: Whether this species should be placed with *cribulosa* or with the *puberula* or even with the *trapezifera* groups is uncertain. The palpi are impressed and the pygidial groove is present, characters that do not occur together in members of the last two groups named. The clypeus (fig. 59) is the same as in some individuals of *cribulosa*, but of course the labrum differs, not being bilobed in *rugosifrons*, although it is somewhat hollowed out, about as in *marginicollis* and *ingenue* Fall. The sinuate sides of the pronotum and the front angles are much as in species near *atramentaria* Bates.

All the specimens examined are very worn, the hairs on the head and pronotum being scarcely visible and those on the elytra being quite sparse. Unfortunately the genitalia of the only male available were lost.

SPECIES GROUP *guatemalica*

Diplotaxis guatemalica Moser

Figure 129

Diplotaxis guatemalica Moser, 1918, p. 306 (Guatemala City, Guatemala; type, female, in Zoologisches Museum, Berlin).

DIAGNOSIS: Minute hairs present in interval, not striae punctures of elytra; abdomen ridged on sides, sometimes but weakly. The elytra appear glabrous except under high magnification ($\times 14$ power). Characterized by

its shining, very convex pronotum which contrasts with the rather glazed sericeous elytra, the long, nearly parallel-sided clypeus with rounded angles and abruptly indented sides, the retraction of the head into the thorax so far as to hide a good bit of the eyes.

RANGE: Specimens have been seen from Guatemala and Costa Rica, but none from the area between these countries. The total of 78 specimens examined are as follows: Guatemala. *Guatemala*: Guatemala City, three (including the type); 70 miles east of Guatemala City, May, 1947, one. *Jalapa*: Eight kilometers east of Jalapa, 1425 meters, May, 1947, 65. *Retalhuleu*: Retalhuleu: four. Costa Rica. No further locality, two males (dissected). *Cartago*: Irazu, 6000 feet, two. *Guanacaste*: Bebedero, one.

DESCRIPTION: Length, 7 to 9 mm. (one specimen, 10 mm.). Head and center of pronotum often black. Head minutely hairy, front descending rather abruptly to clypeus, sometimes slightly concave at center, densely, finely punctured. Clypeal suture obliterated or represented by impunctate space. Clypeus hairy, usually as long as head, punctured as on head, narrowed in front, front margin shallowly or deeply (in type) emarginate between rounded angles that are broadly reflexed, side margins indented abruptly in front of eyes. Eyes each one-fifth or one-sixth of width of head. Antennae 10-segmented. Maxillary palpi without impression on last segment. Mandibles small. Labrum densely punctured, slightly concave medially, sides rather prominent; transverse, four or five times wider than long, same length at middle as reflexed under side of clypeus, front margin scarcely arcuate. Mentum with declivity in anterior third posteriorly arcuate, margined, and pubescent.

Pronotum virtually glabrous, only minute hairs present, widest behind middle, irregularly, sparsely punctured with small punctures as on head (one specimen has larger, dense punctures), usually an impunctate space or line at middle (lacking in type); side margins strongly margined, strongly arcuate, angles not acute, base sometimes with suggestion of transverse impression. Scutellum densely punctured. Elytra with minute hairs in punctures of intervals, surface usually

sericeous, punctures larger, denser than those on pronotum, second interval multipunctate, costae flat, with smaller punctures than on intervals, marginal hairs very short, but longer than minute dorsal hairs.

Abdomen with elevated chitinous ridge on sides or at least a sharp delimiting line extending to spiracles, fifth segment without transverse groove or with it but faintly indicated. Pygidium moderately to densely punctured, very large. Front tibiae with third tooth at or just in front of middle. Hind tarsi as long as hind tibiae. Claws angularly bent, toothed subapically, tooth almost as long as apex of claw. Genitalia as in figure 129.

SEXUAL DIMORPHISM: In male, hind tarsi longer than hind tibiae, with first segment fully as long and as narrow as second segment; in female first segment shorter and wider apically than second. Hind tibial spurs wider in female, but not so wide as in females of some species of *puberula* group.

REMARKS: This species would probably not normally be recognized as being dorsally hairy, but it is included as a hairy species because the hairs are mentioned in the original description and because they are visible on specimens in good condition. The clypeus and general shape are very much as in *poropyge* Bates, another hairy species occurring in Guatemala and Costa Rica, but the latter has long hairs, a longer labrum, large and coarse, not fine and sparse, pronotal and elytral punctures, shining elytra, and different male genitalia. The lateral lobes in *guatemalica* are very short and stout, much as in *misella* Fall from northern Mexico and the United States, a tiny species in the *misella* group.

The surface of the elytra is filled with minute granulations, best seen if the beetle is tipped forward, which gives the alutaceous, glazed effect. Although the type has the abdominal ridge strongly elevated, it is not usually so definite as in *cavifrons* Moser, for instance, but the edge where the dorsal and ventral segments come together is at least thickened and keeled in most individuals. It has been taken in three of the same localities as *cavifrons*.

A large series of 65 specimens taken by R. R. Miller near Jalapa, Guatemala, on May 9, 1947, is composed almost entirely of

females (only 10 are males); it would be interesting to know whether this proportion is due to the time of capture or not. Individuals from Costa Rica are rather larger than those seen from Guatemala and have the elytra not so markedly sericeous.

SPECIES GROUPS *puberula* AND *pilipennis*

The 13 species treated here are in two groups: the *puberula* group with eight species and the *pilipennis* group with five species. Although these groups appear to me to be distinct, they are not always separable by definite characters, and I have therefore put them for convenience in the same key. Actually the *pilipennis* group seems to be similar to the *trapezifera* complex, which is composed of many species that are dorsally glabrous except for the hairy front margin of the clypeus. (See discussion of *pilipennis* group below.)

KEY TO THE SPECIES OF THE *puberula* AND *pilipennis* GROUPS¹

1. Abdomen laterally with raised chitinous ridge, or at least a shining keel, sometimes hidden under edge of elytra . . . 2
Abdomen smoothly rounded at sides, without trace of lateral ridge or keel . . . 4
2. Elytra with strial, but not interval, punctures virtually bare of hairs (hairs not visible at X14 power) (fig. 69); pronotum same width at base as apex, with coarse dense punctures as on elytra; Mexico, Guatemala, and south to Panama
 . . . *poropyge* (in part) (*puberula* group)
Elytra with all punctures of striae and intervals distinctly hairy; pronotum wider at basal angles than at apex, with fine, dense punctures of much smaller size than those on elytra; Guatemala, and Chiapas, Mexico 3
3. Pubescence short, appressed to surface, on elytra no longer than distance between punctures; head abruptly excavate in front . . . *cavifrons* (*puberula* group)
Pubescence very long, erect, at least as long as scutellum; head flat or gently

¹ To ascertain whether hairs are present or not in strial punctures of the elytra, specimens should be tipped backward. The striae are the rows on each side of the narrow and broad intervals; those next to the suture are the easiest to find (fig. 69). If a specimen has the hairs much worn, it cannot be identified by this key.

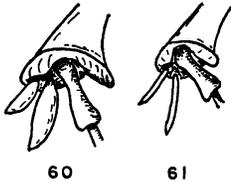
- concave in front
 *crinigera* (*puberula* group)
- 4(1). Elytra with punctures of every row distinctly hairy 5
Elytra, at least in apical half, with strial rows of punctures virtually bare of hairs, especially striae next to suture (fig. 69) 12
 5. Clypeus with dentiform angles in front or clypeus sharply bi-angulate; if doubtful, then either pronotum not so transverse and with sides at base usually constricted just in front of the sharp hind angles (fig. 66), or all hairs on elytra of equal length; punctuation of pronotum always fine, dense; Michoacan
 *selanderi* (*pilipennis* group)
Clypeus with rounded angles or clypeus more or less bilobed; if doubtful, then either pronotum very transverse, hind angles rounded off or obtuse without constriction, or some hairs of elytra much longer than others, especially on suture; punctuation of pronotum variable 6
 6. Pronotal punctures on disc sparse, at least sparser than those on head 7
Pronotal punctures on disc dense, touching, about as dense and regular as those on head 9
 7. Clypeus short, usually not more than half of length of head; labrum nearly twice as long as reflexed under side of clypeus and deeply, densely punctured; each eye about one-fifth of width of head; Texas, Louisiana; northeastern Mexico
 . . . *puberula* (in part) (*puberula* group)
Clypeus as long as head, or nearly as long; labrum less than twice as long as reflexed under side of clypeus and shallowly, densely punctured; each eye about one-fourth of width of head; northeastern Mexico south to Chiapas and Guatemala 8
 8. Pronotum with punctures extending all the way to base without impunctate space or depression across base, side margins with bulge nearer middle (fig. 65); male genitalia as in figure 132
 *hirsuta* (*puberula* group)
Pronotum with convex impunctate space or depression across base (best seen by tipping specimen forward), side margins with bulge nearer base (fig. 64); male genitalia as in figure 130
 . . . *subrugata* (in part) (*puberula* group)
 - 9(6). Hairs on suture and other intervals of elytra as long as scutellum or at least much

longer than hairs on striae; central Mexico to Guatemala

. *puncticollis* (*puberula* group)
Hairs of same length in all punctures of elytra and not more than one-third of length of scutellum; United States, Mexico10

10. Mentum flat, without distinct anterior declivity; labrum short, no longer than reflexed under side of clypeus; pronotum with sides extremely arcuate (fig. 93); female with hind tibial spurs narrow, thread-like, as in male (fig. 61); western coast of Mexico, also Veracruz

. *coriacea* (*puberula* group)
Mentum with well-marked margin to anterior declivity; labrum longer than (often twice as long as) reflexed under



FIGS. 60, 61. Apices of left hind tibiae of females of *Diplotaxis*. 60. Stout spurs as in *D. puberula*, *hirsuta*, *subrugata*, and *rita*. 61. Thread-like spurs as in *D. coriacea*.

side of clypeus; pronotum with sides less arcuate; female with hind tibial spurs twice as wide as in male and as wide as first tarsal segment near base (fig. 60); United States, eastern Mexico11

11. Clypeus shorter than head, usually about one-half of its length; pronotum with all punctures of same size and density, only an occasional individual with any impunctate space; United States, north-eastern Mexico

. *puberula* (in part) (*puberula* group)
Clypeus usually as long as head; pronotum with both large and small punctures in dense irregular clusters, some of the punctures confluent; eastern, southern Mexico

. *subrugata* (in part) (*puberula* group)
12(4). Clypeus markedly quadridentate, its front margin black and strongly reflexed; Oaxaca, Mexico

. *zapoteca* (*pilipennis* group)
Clypeus bidentate, biangulate, or bilobed, its front margin may or may not be black and strongly reflexed13

13. Panama north to the Isthmus of Tehuantepec, southeastern Mexico; clypeus with sides indented angularly in front of

eyes, thence nearly parallel to front margin; labrum usually longer than reflexed under side of clypeus

. *poropyge* (in part) (*puberula* group)
Western and central Mexico; clypeus (figs. 73, 74) with sides either outwardly sinuate in front of eyes, or straight, but not indented, thence oblique to front margin; labrum no longer than reflexed under side of clypeus14

14. Size small (7 to 8.5 mm.), color, pale tawny; pronotum proportionately shorter (less than one-third of length of elytra), pronotum flat and irregularly, sparsely punctured; northwestern Mexico south to northern Jalisco

. *pilipennis* (*pilipennis* group)
Either size usually larger (9 to 11 mm.) or color darker (deep red to black); pronotum proportionately longer (one-third or more of length of elytra), pronotum flat or convex, punctuation variable; central Mexico north and west to southern Durango15

15. Mentum flat, not declivous in front; elytral striae with occasional hairs often near apex; labrum usually shorter than reflexed under side of clypeus; central Mexico (Michoacan, state of Mexico)

. *tarascana* (*pilipennis* group)
Mentum declivous in front; elytral striae always bare of hairs; labrum usually same length as reflexed under side of clypeus; Pacific coast (Nayarit, southwestern Durango)

SPECIES GROUP *puberula*

Diplotaxis puberula LeConte; *subrugata* Moser; *hirsuta*, new species; *poropyge* Bates; *puncticollis* Moser; *crinigera* Bates; *cavifrons* Moser; and *coriacea* Bates.

The species of this group are mostly small (6 to 10 mm.). They have fine, hairy, not scaly, dorsal vestiture; trapezoid clypeus with the angles rounded or obtuse, sometimes sharp but not dentiform as in the *pilipennis* group, and the sides usually abruptly indented in front of the eye, or at least sinuate; labrum at least as long as under side of clypeus; and the elytral costae so obscured by large punctures of about the same size as those on the intervals that they are scarcely recognizable as costae.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Dorsal surface hairy.

Each eye about one-quarter (rarely one-fifth) of width of head. Antennae 10-segmented. Maxillary palpi with last segment not impressed dorsally. Mandibles large and stout in the first four species, much less so in *puncticollis*, *crinigera*, *cavifrons*, and *coriacea*. Scutellum densely punctured. Pygidium densely punctured. Front tibiae tridentate. Middle tarsi with first segment as long as or slightly longer than the second. Claws angularly bent, cleft subapically, tooth almost as long as apex of claw and much thicker.

SEXUAL DIMORPHISM: Males with hind tarsi scarcely, if at all, longer than hind tibiae, females with them shorter. Male with first segment of hind tarsi same length as, or slightly longer than, longer of two tibial spurs, female with it shorter. Hind femora usually wider and pygidium more transverse in male, but these differences not always very noticeable (see table 4).

A key to the species of the group is given above.

DISCUSSION: The species of this group can be distinguished from any other of the hairy species by the combination of a flat, not cleft or concave, labrum which is level with the under side of the clypeus; tarsi normally hairy, not furnished with thick pads obscuring the surface; pubescence fine, not setae-like or scaly; antennal club pale, not black;

clypeus with the sides abruptly indented, not straight or outwardly sinuate; and a distribution from southern and eastern Mexico south to Panama on the mainland. Three species from Guatemala that fit the above but are not in the group are *aurata* Bates, known only from the type, which has a peculiar elytra (see the species); *alutacea* Bates, which has a different labrum and hairs present in the narrow elytral intervals only; and *guatemalica* Moser which has scarcely visible pubescence. Two of the species of the group, however, prove to be exceptions to the distribution as given; *puberula* occurs as far north as Texas (it has a labrum nearly three times longer than the reflexed under side of the clypeus), and *coriacea* as far north on the west coast of Mexico as Sinaloa and southern Durango (recognizable by a very bulging pronotum as shown in fig. 93).

The first four species of the group are more closely linked than the others because they have a larger labrum and noticeably large mandibles; three of these (*puberula*, *subrugata*, and *hirsuta*) also have in common in the female very thick apical spurs on the hind tibiae (fig. 60), often wider than the base of the first tarsal segment, and very short hind tarsi. All the species have hairs in the striae as well as in the interval punctures of the elytra, but in *poropyge* the striae hairs are so

TABLE 4
SYNOPTIC TABLE OF *puberula* AND *pilipennis* GROUPS OF *Diplotaxis*

Species	Sides of Abdomen	Strial Punctures	Supplementary Diagnostic Characters
<i>cavifrons</i>	Ridged	Hairy	Frons deeply excavated; hairs very short
<i>crinigera</i>	Ridged	Hairy	Frons not excavated; hairs very long
<i>poropyge</i>	Usually ridged	Virtually bare	Long, big labrum
<i>costanera</i>	Not ridged	Bare	Pronotum, punctures sparse, coarse; mentum declivous
<i>pilipennis</i>	Not ridged	Bare	Pronotum, punctures sparse, coarse; mentum flat
<i>tarascana</i>	Not ridged	Partially bare	Pronotum, punctures dense, fine; mentum flat
<i>zapoteca</i>	Not ridged	Bare	Clypeus markedly quadridentate
<i>coriacea</i>	Not ridged	Hairy	Elytral hairs of equal length
<i>hirsuta</i>	Not ridged	Hairy	Long, big labrum; clypeus long; base of pronotum punctured
<i>puberula</i>	Not ridged	Hairy	Long, big labrum; clypeus short
<i>puncticollis</i>	Not ridged	Hairy	Elytral hairs of unequal length
<i>selanderi</i>	Not ridged	Hairy	Clypeus dentiform
<i>subrugata</i>	Not ridged	Hairy	Long, big labrum; clypeus long; base of pronotum impunctate

minute that they could readily be overlooked. The sides of the abdomen are ridged in some species, not in others, and may be either way in *poropyge*.

All the species occur in Mexico, *poropyge* continuing all the way south to Panama, and *puberula* extending north to Texas and Louisiana. The latter species has not previously been reported from Mexico. At least 1200 specimens have been examined, over 1000 of which are divided between *subrugata* and *hirsuta*, as also the types of all the forms.

***Diplotaxis puberula* LeConte**

Figures 60, 130, 131

Diplotaxis puberulus LECONTE, 1863, p. 76 (Texas; type, male, in Museum of Comparative Zoölogy).

Diplotaxis villosa FALL, 1909, p. 26, pl. 1 (Texas; type, male, in Museum of Comparative Zoölogy). New synonymy.

DIAGNOSIS: Hairs short, equal in length, present in all punctures, abdomen not ridged. The labrum in this species is larger, longer, and more strongly, densely punctured than in others of the group; it is also entirely flat and virtually depressed below the level of the under side of the clypeus.

RANGE: Northeastern Texas and southwestern Louisiana south to the states of Nuevo Leon and Tamaulipas in northeastern Mexico. Specimens examined total 66, only 10 of which are from Mexico. (See Appendix for locality data.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red to piceous. Length, 7 to 9 mm. Head with front gently sloping or abruptly declivous to clypeus, densely, rugosely punctured with either large or small punctures, usually with a transverse ridge behind clypeus, often broken at middle. Clypeus from one-half to more than that of length of head, broad in front, punctures about as on head, front margin truncate or slightly emarginate, broadly reflexed, angles broadly rounded, lateral margins straight or slightly emarginate. Labrum flat, arcuate in front, densely, strongly punctured, as long medially as under side of clypeus, usually longer. Mentum declivous in anterior half, declivity posteriorly arcuate, margined and pubescent, usually hind margin of declivity sinuate and

its surface with lateral depressions, front margin of declivity sometimes elevated.

Pronotum with sides weakly arcuate behind middle, angles not produced or impressed, surface with punctures of same size as those on head and either small and dense, or larger and sparser, base punctured as usual. Elytra with hairs not or scarcely longer than the distance between the punctures, punctures everywhere dense, sometimes larger than those on pronotum, second interval multipunctate, costae scarcely evident because their punctures are only slightly smaller than those on intervals, marginal hairs short or a little longer than dorsal hairs, dense but fine.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Front tibiae with three outer teeth well in front of middle. Genitalia as in figures 130 and 131.

SEXUAL DIMORPHISM: Male with hind tibial spurs narrow, thread-like, but female with them very broad, often as wide as first tarsal segment (fig. 60).

REMARKS: This species differs from two similar species from Mexico (*subrugata* and *hirsuta*), both of which occur also in the state of Tamaulipas, by having the clypeus shorter, only about one-half of the length of the head, its front margin broader, usually almost truncate, or scarcely sinuate, the head also broader, with more space between the eyes, the pronotum more transverse, flatter, and the male genitalia different. Although both of these species were taken, along with *puberula*, at Villagran in northern Tamaulipas, neither has been recorded from the United States. Thus the northern limit of their range just overlaps the southern limit of the range of *puberula*.

Although the types of Fall's and LeConte's forms present some differences (the head, pygidium, and pronotum have smaller, denser punctures in *puberula* than in *villosa*; the clypeus is truncate in front in the former, sinuate in the latter), these differences do not hold when many specimens are examined, and they are not supported by constant differences in the male genitalia. The latter vary slightly from individual to individual, and of 20 males dissected, there are a number of variations represented, the lateral lobes being joined either nearer to or farther from the

base, the apices being stouter or narrower and either more or less deflexed when viewed in profile (figs. 130, 131). The phallus and internal sac appear to be the same. The head and pronotal punctuation is dense and small in the majority of specimens from Texas and in one or two from northern Mexico, but it is sparse in the three individuals from Brazoria and Matagorda counties, Texas, and in 14 from southwestern Louisiana ("*villosa*"). A few specimens from Harris and Limestone counties, Texas, have the punctures neither so sparse nor so dense, and the same is true of a small series from Villagran, Tamaulipas. Variations in the sinuation of the clypeal margin occur throughout. A character mentioned by Fall for *puberula* (1909, p. 28) has been found in both densely punctate and sparsely punctate individuals, namely, that the anterior suture of the mental declivity is curved forward at the middle and is sometimes somewhat elevated. It therefore seems best to consider these forms conspecific.

A specimen that is in every other way like the others, from Kendall County, Texas, has the front margin of the clypeus with a double sinuation, thus making a lobe at the middle between the rounded side angles.

***Diplotaxis subrugata* Moser**

Figures 60, 64, 70, 130

Diplotaxis subrugata MOSER, 1918, p. 298 (Mexico, here restricted to northeastern Mexico; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Hairs short, equal in length, present in all punctures, abdomen not ridged. Extremely similar to *hirsuta* and occurring within its range. Differs from *hirsuta* by having a narrow line across the base of the pronotum free of punctures and rather convex, by having the sides of the pronotum arcuate nearer the base, not the middle (fig. 64), the punctuation denser, rugose, the general pubescence shorter, and the male genitalia without hairs on the inner apices of the lateral lobes.

RANGE: Eastern Mexico from the state of Tamaulipas south through San Luis Potosi and Hidalgo to Papantla in central Veracruz; one specimen from southern Durango on the west coast is probably mislabeled. Specimens examined total 479. (See Appendix for locality data; see fig. 70.)

HABITAT: A series of 357 specimens were taken by C. and P. Vaurie at Papantla, Veracruz, at night from various plants in a weedy field; the majority came from one clump of catclaw (*Acacia?*) which was continually picked over for a couple of hours, the beetles reappearing from somewhere at every turn around the clump. One of the other plants was *pata de vaca* (*Bauhinia mexicana*). Most of the specimens from Tamazunchale, San Luis Potosi, were taken at a light trap.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red. Length, 6 to 9 mm. Head as in *puberula*. Clypeus deeply scooped out or concave, almost as long as head, narrowed towards front, punctures same as those on head, margins broadly deeply reflexed, lateral margins angulate or sinuate in front of eyes, anterior margin slightly to strongly emarginate, angles broadly rounded. Labrum flat, arcuate in front, densely, but finely, faintly punctured, no longer at middle than reflexed under side of clypeus. Mentum declivous in anterior third or half, declivity posteriorly arcuate, margined, and pubescent.

Pronotum with hairs not always noticeable except in profile, sides very strongly arcuate behind middle, the bulge nearer base, pronotal angles not produced or impressed, surface with punctures on sides dense and rugose as on head, less dense at middle, base with narrow impunctate space just in front of margin. Elytra, abdomen, and front tibiae as in *puberula*. Genitalia as in figure 130.

SEXUAL DIMORPHISM: As in *puberula*.

REMARKS: This species differs from others of the group in an additional character which is not, however, very reliable. This is that the prosternal process between the front legs, which is normally unicarinate in the genus, appears more or less tricarinate in *subrugata* because the chitin is pinched and ridged on each side of the central carina. In *subcostata* from the southeastern United States this process differs by being fairly constantly bicarinate. Of 40 specimens of *subrugata* from Valles, San Luis Potosi, the process is tricarinate in 18, unicarinate in 14, bicarinate (hollow in center) in six, and virtually without carina in two. Many specimens, of course, have this area hidden, either by another part of the body or by debris, so that it is not al-

ways an easy character to examine.

Individuals at hand from Tamaulipas, San Luis Potosi, and Hidalgo are uniformly a little smaller than the southern individuals from Veracruz. Most of these northern specimens are also quite worn, the pubescence scarcely showing on the pronotum and parts of the elytra. In the southern specimens, which are in fresher condition, the hairs are seen to be perhaps a bit shorter than the hairs of *hirsuta*. The head, as is also true of many *hirsuta*, is often black or at least darker than the clypeus. One specimen from Valles has the clypeus so indented in front that it resembles some individuals of *coriacea* Bates from the western coast of Mexico. The hind tarsi in the female are scarcely longer than the pygidium is wide. The male genitalia are about as in *puberula* (fig. 130).

A single specimen from El Salto, Durango, was doubtless mislabeled, because this locality is not in keeping with the known geographical range of the species; it is not shown on figure 70.

***Diplotaxis hirsuta* Vaurie, new species**

Figures 60, 62, 63, 65, 132

TYPE MATERIAL: Type, male, Tamaunchale, San Luis Potosi, Mexico, March 29, 1951, John D. Lattin, collector. (See Appendix for locality data on the paratypes and other specimens, almost 700 of which have been examined.) Type and paratypes in the American Museum of Natural History, and some paratypes are in the following collections: United States National Museum; University of California at Berkeley; California Academy of Sciences; University of Arizona; Instituto de Biología, University of Mexico; Dr. Henry Howden; Rev. Bernard Rotger; Zoologisches Museum, Berlin; University of Michigan; Senckenberg Museum, Frankfurt; and Zoologische Staatssammlung, Munich.

DIAGNOSIS: Hairs short, often unequal (short and long) on elytra, present in all punctures, abdomen not ridged. Scarcely distinguishable externally from *subrugata* Moser (which precedes) and with which it occurs in many localities, but the male genitalia, as well as other relative characters, differ. In series it is separable by its larger size, more shining appearance, rather longer hairs,

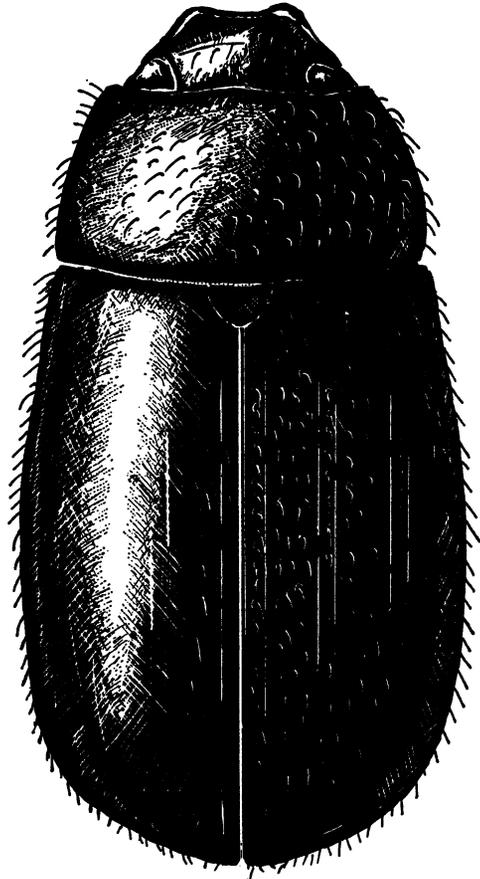


FIG. 62. *Diplotaxis hirsuta*, new species.

sparser pronotal punctures, and by the absence of the convex impunctate transverse area across the base of the pronotum (the punctures in *hirsuta* extend to the base).

RANGE: Eastern Mexico from the states of Nuevo Leon and Tamaulipas in the north to Oaxaca and Chiapas in the south; also Guatemala. (See fig. 63.)

HABITAT: Twelve specimens from the mountains near Jacala, Hidalgo, were picked at night from bushes (some of the genus *Rhus*) or low thorny trees along a path, in company with four other species, one of which (*puncticollis*) is in the same group. A larger series from Papantla, Veracruz, taken with *subrugata* and two other species, were collected in the same manner from a large, weedy field with scattered mesquite and cat-claw and *pata de vaca* (*Bauhinia mexicana*). Like *subrugata*, this species is evidently not confined to any particular altitude, having

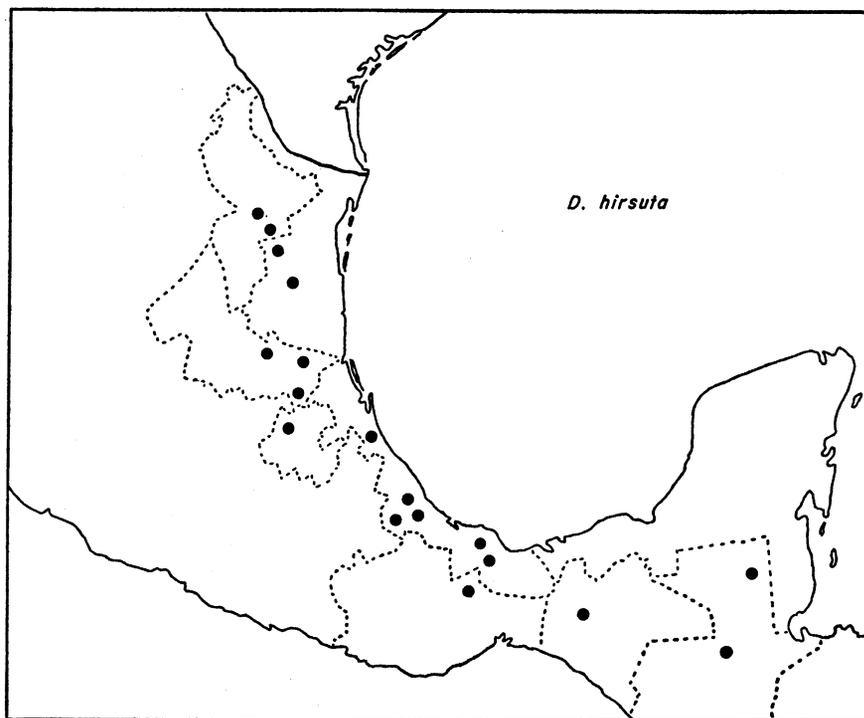


FIG. 63. Distribution of *Diplotaxis hirsuta*, new species.

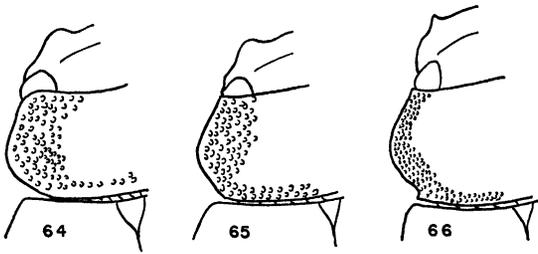
been taken at 300 as well as 8000 feet. A series from Tamazunchale, San Luis Potosi, were taken at a light trap in April.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Color, black. Length, 9 mm. Head with front sloping gently to clypeus, densely, rugosely punctured and with slight transverse ridge behind clypeus. Clypeus almost as long as head, narrowed to front which has margin deeply, broadly reflexed, slightly emarginate, the angles rounded, lateral margins nearly straight, punctures same as on head. Labrum slightly convex, arcuate in front, lightly sparsely punctured, same length at center as reflexed under side of clypeus. Mentum declivous in anterior half, declivity posteriorly arcuate, margined, and pubescent.

Pronotum with sides strongly arcuate near middle, strongly margined and almost crenulate, angles not produced or impressed, surface with punctures of same size as those on head, but sparser, base punctured as usual. Elytra, abdomen, and front tibiae as in *puberula*. Genitalia as in figure 132.

SEXUAL DIMORPHISM: As in *puberula*.

REMARKS: The male genitalia differ from those of other members of the group by having short hairs visible on the inner sides of the apices of the lateral lobes (fig. 132). The genitalia of about 40 specimens from various localities were examined. Differences between this species and *subrugata*, in addition to those mentioned in the diagnosis, are: the clypeus is generally broader in *hirsuta* but not so deeply hollowed out and more often only slightly, not deeply emarginate in front; the sides of the pronotum have the arcuation nearer the middle, not so far back (fig. 65); the pronotum is more transverse; and the second segment of the antennal funicle is usually the same size as the third, not much longer as is generally true in *subrugata*. Size and color vary in both species; in *hirsuta* the length ranges from 7 to 11 mm., in *subrugata*, from 6 to 9 mm. In the series from Papantla, Veracruz, composed of both species, all the *hirsuta* are black and slightly larger than the *subrugata* which are either reddish brown or black. From Tamazunchale, San Luis Potosi, however, there are more small than large in-



FIGS. 64–66. Head and pronotum, three-quarter view, of some hairy species; hairs not shown. 64. *D. subrugata*, showing basal transverse space. 65. *D. hirsuta*. 66. *D. selanderi*, showing constriction of sides at base.

dividuals of *hirsuta* (but none so small as *subrugata* from Tamaulipas), and the color is reddish brown or black. A series of 66 *hirsuta* from Linares, Nuevo Leon, are generally large and black; a series from Jesus Carranza, Veracruz, generally brownish. The range of *hirsuta* extends farther north, to Nuevo Leon, and farther south, to the Peten region of Guatemala, than that of *subrugata*. In the four localities where they were taken together *hirsuta* was more abundant than the other form in Tamazunchale (286 to five), but less abundant in Villagran (four to 11), Valles (three to 61), and Papantla (87 to 357). Neither of these most abundant species was named at the time of the writing of the "Biologia Centrali-Americana"; in fact until now there have been no species described from the northeastern section of Mexico. There is, however, a hairy species from across the border in the United States (*puberula* LeConte) which differs from the other two by having a larger, longer labrum, a broader, shorter clypeus, and smaller eyes.

Although the hairs of the elytra are short in the type, in some specimens as in a series from Sayula, Veracruz, the elytral hairs are twice as long as the distance between the punctures on some intervals but shorter on others.

Diplotaxis poropyge Bates

Figures 67, 133

Diplotaxis poropyge BATES, 1887 (1887–1888), p. 160 (type locality not designated; type, female, is from San Geronimo, Guatemala; in British Museum).

Diplotaxis subrugosa MOSER, 1918, p. 297

(Bebedero, Costa Rica; type, male, in Zoologisches Museum, Berlin). New synonymy.

DIAGNOSIS: Hairs short, unequal in length on elytra, present in interval punctures of elytra, virtually absent from stria punctures, sometimes narrow intervals with longer hairs than broad intervals, abdomen ridged, occasionally not ridged. Agrees with the three preceding species in the long, large labrum and large mandibles, but differs from all species of the group in the absence of hairs on the punctures of the elytral striae.

RANGE: Veracruz, Chiapas, and Yucatan in southern Mexico, south to Panama. A total of 67 specimens examined. (See Appendix for locality data; see fig. 67).

HABITAT: Five specimens were taken by P. and C. Vaurie at night from weeds and thorny bushes on a hillside near Lake Catemaco (a volcanic lake), Veracruz. Some of the weeds were of the Rubiaceae family. Another hairy species was taken also at the same time (*microtichia* of the *puberea* group) as well as hundreds of examples of the small glabrous species *simplex* Blanchard.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red. Length, 7 to 10 mm. Head almost perpendicular to clypeus, densely rugosely punctured. Clypeus with punctures as on head, nearly as long as head, front margin slightly emarginate and reflexed (straight in type), angles very broadly rounded and strongly reflexed, side margins abruptly angulate in front of eye (virtually straight in type). Labrum as in *puberula* but shorter. Mentum with declivity in anterior third

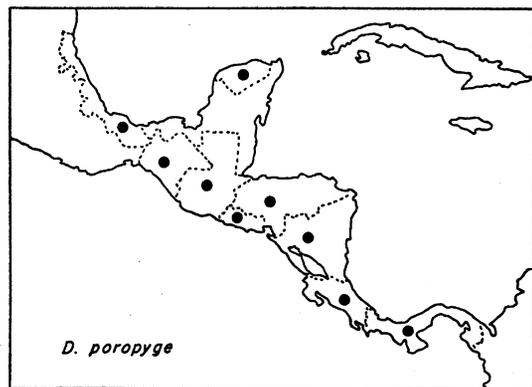


FIG. 67. Distribution of *Diplotaxis poropyge*.

posteriorly arcuate, margined, and pubescent.

Pronotum very convex, sides strongly margined, strongly arcuate behind middle, punctures dense and of same size as on head, angles not produced or impressed, base often with narrow impunctate space and/or depression. Elytra with hairs in interval punctures but those of striae so minute as to be invisible except at high magnification, hairs either short throughout (no longer than distance between punctures), or longer on narrow intervals; remainder of elytra as in *puberula*.

Abdomen with elevated chitinous ridge laterally, extending to or nearly to posterior spiracles, ridge sometimes obsolete or nearly so; fifth segment without groove above pygidium. Front tibiae as in *puberula*. Genitalia as in figure 133.

SEXUAL DIMORPHISM: Female with hind tibial spurs wider than those of male, but not so wide as in females of *puberula* (fig. 60).

REMARKS: This species has about the longest geographical range in the genus, the whole of Central America from southern Veracruz to Panama. It and *zeteki* (Barro Colorado, Panama) are the southernmost species of the genus. In Veracruz it occurs with three others of the group (*puncticollis*, *subrugata*, and *hirsuta*) and in Guatemala also with *puncticollis*.

One of the few definite diagnostic characters in the genus breaks down in this species, as it does also to some extent in the case of *bowditchi* and *puberea* of the *puberea* group and in *cribulosa* of the *cribulosa* group. This is the presence or absence of the chitinous ridge on the sides of the abdomen. With all other characters appearing equal, including the male genitalia, about a third of the specimens examined have no chitinous ridge, although some of this third have the line of demarcation between ventral and dorsal sides very sharp, almost ridged. These specimens with virtually no ridge come from Yucatan, Chiapas, and Veracruz, Mexico, also from La Chorrera and Poterillos, Panama, at opposite ends of the geographic range. From just to the north of Panama, at San Miguel de Barranca and Las Canas in Costa Rica, I have seen two large series in which there are a few individuals that have the ridge so poorly developed that it might be classed

as no ridge; the rest have a definite ridge. Of two specimens at the British Museum collected by Biolley in Costa Rica, the male has the abdomen ridged, the female not. All the specimens (20) examined from Guatemala, Honduras, El Salvador, and Nicaragua have an unmistakable ridge. The type (Guatemala) and the type of "*subrugosa*" (Costa Rica) both have the abdomen ridged.

There is also some difference in the size and hairiness of this species, but these differences do not correspond with the presence or absence of the ridge. Thus some of the largest as well as some of the smallest individuals occur among the five from Veracruz and the seven from La Chorrera, Panama, localities in which the abdomen is not ridged. Although many individuals have the hairs of the same length on the elytra and all uniformly short, some from various localities have longer hairs on the suture and narrower intervals. The short hairs may have been worn down, because the pronotal hairs are also short in these individuals.

Bates does not mention the ridged abdomen for any of his other species that do have it (*arctifrons*, *contracta*, *crinigera*), so that perhaps he was not aware of this character in *poropyge* either, or thought it unimportant. The type of *subrugosa* Moser (Bebedero, Costa Rica), also with ridged abdomen, has been compared with a toptype of *poropyge* from San Geronimo (a "Biologia" specimen) and with other specimens from Guatemala, and the type of *poropyge* has been examined. The only differences are in the longer hairs on the suture and narrow intervals in the toptype, and in the tumid abdomen of the type of *subrugosa*. This latter is often a variable character in the genus, and in fact the other males examined from Costa Rica have no swelling on the abdomen. Two other specimens, from Panama and Guatemala, have the abdomen tumid. Moser's species is therefore considered synonymous with *poropyge*.

***Diploptaxis puncticollis* Moser**

Figures 68, 134, 135

Diploptaxis puncticollis MOSER, 1918, p. 303 (Necaxa [Puebla], Mexico; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Hairs long, on elytra shorter

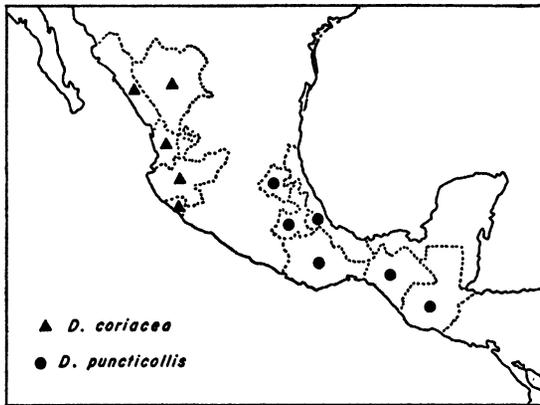


FIG. 68. Distribution of *Diplotaxis puncticollis* and *D. coriacea*.

in punctures of striae, but present in all punctures, abdomen not ridged. Differs from *poropyge* by having hairs in the striae as well as in the interval punctures of the elytra and very fine, dense, pronotal punctures with long hairs. Most similar to *crinigera* and *cavifrons* in shape and punctuation of pronotum and in female characters, but with abdomen not ridged on sides as in those species.

RANGE: Eastern Mexico from the states of Hidalgo and Puebla south through the Isthmus of Tehuantepec into Guatemala. A total of almost 200 specimens has been examined. (See Appendix for locality data; see fig. 68.)

HABITAT: Six specimens from Jacala, Hidalgo, were taken by C. and P. Vaurie from low bushes or trees at night in company with 12 individuals of *hirsuta*, 16 of *jacala* (a hairy species of *puberea* group), four of *fossifrons*, and some of another glabrous species. Some of the vegetation on which the beetles were found included two species of the genus *Rhus*.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red or black. Length, 7 to 9 mm. Head almost perpendicular to clypeus, all punctures touching, the center part more or less flattened, often rather concave. Clypeus about one-half of the length of head, punctures dense as on head, front margin truncate or slightly sinuate and scarcely, sometimes strongly, reflexed, angles rounded, sides usually abruptly angulate in front of eyes or at least sinuate. Labrum flat to slightly concave at center, sides rather pushed forward,

densely punctured, no longer than reflexed under side of clypeus. Mentum with declivity in anterior third posteriorly arcuate, margined, pubescent.

Pronotum with punctures dense and of same size as those on head, or even smaller, sides of pronotum strongly margined, very strongly arcuate behind middle, thence sinuate to front angles, no angles produced or impressed, hind angles obtuse or rounded off, base punctured as usual, but often with faint basal transverse impression. Elytra with hairs longer than distance between punctures, in fresh specimens hairs on suture and intervals erect and twice as long as those on striae which are more depressed, punctures everywhere dense, much larger than on pronotum; other characters of elytra, as well as abdomen and front tibiae, as in *puberula*. Genitalia as in figures 134 and 135.

SEXUAL DIMORPHISM: Female, hind tibial spurs scarcely wider than in male and with apical flare of hind tibiae twice as wide as the constricted part just before apex; apex of sixth segment of abdomen more or less serrate.

REMARKS: The geographic range of this species coincides in part with the ranges of *subrugata* and *hirsuta*, both of which occur farther to the north as well, and with the range of *poropyge* in Chiapas, which extends farther to the south, to Panama. The species occurs along with *cavifrons* and *crinigera* and *poropyge* in Guatemala. A large series of 106 specimens (about 80 of which are males) of *puncticollis* were taken recently by Bechtel and Schlinger at Las Rosas, Chiapas, along with 37 specimens of *crinigera*.

The genitalia of the male and the secondary sexual characters of the female are similar to those present in *cavifrons* and *crinigera*, the lobes in the male being strongly deflexed, narrowing apically, but joined a little nearer the base in *puncticollis*. All three species have the hind tibiae, especially in the female, very narrow and straight, but with a pronounced widening at the apex, and all the females have the same modification of the sixth abdominal segment which is usually slightly extruded.

There are so many hairs in the dense punctures of the pronotum that a yellow fuzzy appearance results, as is true also of *crinigera*. The longest hairs on the elytra are usually

as long as the scutellum. A character noted in this and the two following species and which is apparently present in a lesser degree in some other species is an impunctate, therefore hairless, slightly raised, shiny area on the metasternum extending obliquely backward from near the center, then turning at an angle parallel with the front edge of the hind coxae. There is also an impunctate inverted V at the center base of the metasternum, but because of the way specimens are usually mounted, this area is not readily visible in its entirety.

***Diplotaxis crinigera* Bates**

Figures 80, 134

Diplotaxis crinigera BATES, 1888 (1887-1888), p. 161 (Guatemala, near the city, Guatemala; type, female, in British Museum).

DIAGNOSIS: Hairs long, but shorter on striae of elytra, present in all punctures; abdomen ridged. Very similar to *puncticollis* but with the abdomen ridged and the hind angles of the pronotum explanate. Pronotum about the same shape as in *cavifrons*, from which *crinigera* differs by having no frontal excavation on the head, no pruinosity, and much longer hairs.

RANGE: Guatemala, and Chiapas, Mexico. I have seen the type, from Guatemala City, also 34 males and three females from 4 miles east of Las Rosas, Chiapas, March, 1953; this locality is given as Pinola on the map of Hispanic America (American Geographical Society, 1945); it is about 30 miles southwest of Tuxtla Gutierrez. (See fig. 80.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, tawny or dark red. Length, 7 to 9 mm. Head with front either abruptly declivous or scarcely sloping to clypeus, densely, confluent punctured. Clypeus more than one-half of length of head, punctures dense, front margin straight, or slightly emarginate as in type, broadly reflexed, angles broadly rounded, sides obtusely indented in front of eye. Labrum rather flat, densely punctured, same length at middle as reflexed under side of clypeus. Mentum with declivity in anterior fourth posteriorly arcuate, margined, and pubescent.

Pronotum as densely punctured as head, widest behind middle, sides strongly mar-

gined, weakly sinuate near base where hind angles are rather explanate and reflexed, therefore rather depressed within, and with tufts of thick hairs protruding; sides sinuate to front angles which are somewhat acute; base punctured as usual. Elytra with long hairs in all punctures of intervals, hairs longer than scutellum, striae with shorter, less erect hairs; punctures larger and less dense than on pronotum; second interval multipunctate; costae flat, not well differentiated from intervals, and with smaller punctures; marginal hairs same length as dorsal ones.

Abdomen with strongly elevated chitinous ridge at sides, fifth abdominal segment faintly grooved above pygidium in type, but usually no groove present. Front tibiae as in *puberula*. Genitalia as in figure 134.

SEXUAL DIMORPHISM: Hind tibial spurs of female only slightly wider than those of male, and hind tibiae straight and narrow up to the pronounced apical widening; apex of sixth abdominal segment sinuate at middle and slightly projecting over edge of pygidium in female; sixth segment in male usually not extruded.

REMARKS: Before I had seen any specimens of this species, Dr. E. B. Britton of the British Museum (Natural History) was kind enough to examine the type for me and to make comparative notes with closely related species. These notes are now corroborated by my examination of a series from Las Rosas, Chiapas, collected by R. C. Bechtel and E. I. Schlinger of the University of California at Berkeley. These are the first specimens of this species to be reported from Mexico. They were taken with 106 specimens of the closely related *puncticollis* Moser, and in both series males predominate, in *crinigera* in the proportion of 34 males to three females. The type is only 7 mm. long, lacks all but the first two segments of the hind tarsi, and has the hairs of the elytra worn quite short. Actually the hairs in this species are even longer than in *puncticollis*.

Bates found this species similar to his *poropyge*, but smaller, and differing strongly in the denser and finer punctuation of the pronotum. In the latter character and in its long hairs it resembles *puncticollis*. It differs further from *poropyge* by having distinct hairs

on the striae punctures of the elytra and shorter labrum, from *puncticollis* by having the sides of the abdomen ridged (not mentioned by Bates), and from both by having the pronotum, especially the hind angles, of different shape. There are only two other species with hairy striae and ridged abdomen: *arizonica* from the United States and northern Mexico, which differs by having no hairs on head or pronotum, and *cavifrons* from the same areas as *crinigera*, which differs as stated in the diagnosis above.

In spite of the differences given between this species and *puncticollis*, they can be readily confused at first glance. They must, indeed, be very like, because the genitalia of the males are virtually similar (the lobes as well as the internal sac), except that the lateral lobes are joined a little farther from the base in *crinigera*. Of the 143 specimens of both species taken at Las Rosas, I found one male with the ridged abdomen of *puncticollis* and the explanate hind angles of the pronotum of *crinigera*; all others were immediately separable.

***Diplotaxis cavifrons* Moser**

Figures 80, 134

Diplotaxis cavifrons MOSER, 1918, p. 304 (Guatemala City, Guatemala; type, female, in Zoologisches Museum, Berlin).

DIAGNOSIS: Hairs short, equal in length, present in all punctures, abdomen ridged. Distinguished from others of the group principally by having nearly the entire front of the head deeply excavated, this hole being as wide as the clypeus is long. The hairs on the pronotum often appear thicker than usual (more like setae), and they are extremely short and appressed.

RANGE: Guatemala, and Chiapas, Mexico (see fig. 80). Nineteen specimens have been examined. Guatemala. *Guatemala*: Guatemala City, two females (including the type), one male. *Jalapa*: Eight kilometers east of Jalapa, 1425 meters, May, 1947, two females. *Retalhuleu*: "Retalulen" [= Retalhuleu], eight. Three specimens "Guatemala." Mexico. *Chiapas*: One female; 5 miles south of San Carlos, March, 1953, one male, one female.

Retalhuleu is on the Pacific slope of Guatemala, whereas the other localities are in the highlands to the east and north.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red or tawny. Length, 7 mm. Head with a large, deep excavation (in some specimens not so deep) hollowed out of the front, densely punctured. Clypeus as long as the frontal excavation, with punctures same as on head, clypeus narrowed in front, trapezoidal, its front margin scarcely emarginate, sometimes straight, scarcely reflexed, angles bluntly dentiform, side margins either indented in front of eyes or nearly straight. Labrum with a few large punctures, slightly concave medially, sides rather prominent, labrum very transverse, four or five times wider than long, same length at middle as reflexed under side of clypeus, front margin scarcely arcuate. Mentum with declivity in anterior fourth very shining, posteriorly arcuate, margined, and pubescent.

Pronotum densely punctured, the sides at base with shallow depression, pronotum wider at base than at front, side margins arcuate behind middle, thence weakly sinuate to base and apex, strongly margined, front angles rather sharp, hind angles slightly produced or explanate, base punctured as usual, tumid at sides. Elytra with fine hairs shorter than distance between punctures, punctures much larger than those on pronotum but not so dense, second interval multipunctate, costae flat, with smaller punctures, but costae not well differentiated from intervals, marginal hairs short, no longer than dorsal hairs.

Abdomen with strongly elevated chitinous ridge on sides, fifth segment with somewhat of a groove above pygidium. Front tibiae as in *puberula*. Genitalia as in figure 134.

SEXUAL DIMORPHISM: Female with hind tibial spurs scarcely wider than those of male and with hind tibiae apically flared to twice the width of the constricted part before the apex; apex of sixth abdominal segment slightly projecting at middle.

REMARKS: No other hairy species has such a sharp or deep excavation on the head as on the type and most of the specimens, but two of the individuals from Chiapas have the head only moderately hollowed out. The head usually appears glabrous, but when viewed in profile is seen to have short, fine hairs. A gray opaque covering, or exudation (?), is present on the pronotum, elytra, or

parts of the abdomen of some specimens. The male genitalia (fig. 134) and the hind tibiae and their spurs are similar to those of *crinigera* and *puncticollis*, as well as the finely punctured pronotum, but the hairs are consistently shorter and the head is excavated.

***Diploptaxis coriacea* Bates**

Figures 61, 68, 93, 136

Diploptaxis coriacea BATES, 1888 (1887-1888), p. 161 (type locality not designated, but type, female, is from Ventanas [Durango, northwestern Mexico], in British Museum).

DIAGNOSIS: Hairs short, equal in length, present in all punctures, abdomen not ridged. Differs from others of the group by having the clypeus narrower in front, more shelf-like, scooped out. Pronotum more exaggerated than in the other species (fig. 93), bulging near base. Agrees with *puncticollis* in the fine pronotal punctures and narrow hind tibial spurs in the female, but differs in the clypeus, the shorter hairs, and male genitalia.

RANGE: West coast of Mexico from the states of Sinaloa and western Durango south to Jalisco and Colima; also Veracruz, on the east coast. About 57 specimens have been seen. (See Appendix for locality data; see also fig. 68.)

HABITAT: Six specimens taken by C. and P. Vaurie at Navarrete, in Nayarit, were collected in the daytime, while sweeping in an open weedy patch surrounded by bushes and low trees.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, dark red, head often darker. Length, 6 to 9 mm. Head with front sloping obliquely or abruptly to clypeus, densely punctured. Clypeus almost as long as head, with larger punctures, trapezoidal to quadrate in shape, front margin slightly or strongly emarginate, broadly reflexed, giving scooped-out effect, angles broadly rounded, often rather bilobed, side margins either indented in front of eyes or sinuate. Labrum lightly, densely punctate, flat throughout, about same length as under side of clypeus, arcuate in front. Mentum rather flat, with slight declivity at anterior fourth or fifth, which is posteriorly nearly straight, faintly margined, and pubescent.

Pronotum convex, transverse, sides very strongly arcuate and bulbous behind middle, thence narrowing strongly to front angles which are not produced, hind angles rounded off, punctures dense and of same size as those on head, base more or less impressed, with impunctate space in front of basal margin. Elytra as in *puberula*, but costae flat or convex, with smaller sparser punctures or with punctures confused with those of intervals, marginal hairs about twice as long as those on dorsum. Abdomen as in *puberula*. Front tibiae with basal tooth only a little way in front of middle. Genitalia as in figure 136.

SEXUAL DIMORPHISM: It is difficult to distinguish the sexes without dissection because the usual male characters are so poorly defined and variable. The male has a deeper emargination of the clypeus, with more prominent front angles. The longer of the hind tibial spurs is about one-third longer than the first tarsal segment in both sexes instead of being longer in the female only. The male should have the hind femora narrower and the fifth ventral segment at middle shorter than in the female, but dissection proves that one cannot rely entirely on these relative differences in this species. Female with hind tibial spurs narrow as in male (fig. 61).

REMARKS: This is the only species of this group (with the exception of one doubtful record of *subrugata*) that occurs on the western coast of Mexico, but there are other rather similar hairy species of other groups with the same approximate range (*pilifera* of the *pilifera* group, *costanera* of the *pilipennis* group, and *rugosifrons*). The advanced, more or less scooped-out clypeus (fig. 93) is reminiscent of that of the small scaly species of the *pilifera* and *aenea* groups. The clypeus is sometimes rather flattened, with only the front margin broadly reflexed, not the side margins. The latter vary also in their degree of indentation in front of the eyes and in whether they are oblique or straight to the front margin. The male genitalia (fig. 136) appear rather similar to those of *poropyge* dorsally, but in profile those of *coriacea* are flatter.

I have examined Bates's single specimen from Veracruz. It is abraded, as he said, but appears to be this species. Distribution of a

species up both coasts of Mexico is in accordance with Hobart Smith's Neotropical region (1941, 1949).

As to the type locality, there are four places called Ventanas in northwestern Mexico which is the area covered by the collector of the type specimen, A. Forrer, according to Godman (1915, p. 44). The one in question here, however, is evidently in Durango, because the type in the British Museum has the notation "Ventanas 2000 feet," and elsewhere in the "Biologia" (Orthoptera, vol. 1, p. 106 and others) the locality is given as "Ventanas in Durango 2000 feet (Forrer)." On the map of Hispanic America (American Geographical Society, 1945) it is given (with the alternative name of Villa Corona) on the Ventanas River at 620 meters which is nearly 2000 feet, about 70 miles northeast of Mazatlan, Sinaloa, and perhaps 20 or 25 miles northwest of El Salto, Durango. The location of Presidio as the "Presidio near Mazatlan" of Forrer, given often in the "Biologia," is probably correct, because our specimen is one collected by Forrer. The last doubtful locality is Venodio, which, according to Boyle (1956, p. 153) is El Venadillo, a foothill locality about 5 miles northeast of Mazatlan.

SPECIES GROUP *pilipennis*

The following species compose this group: *Diplotaxis pilipennis* Moser; *costanera*, new species; *tarascana*, new species; *selanderi*, new species; and *zapoteca*, new species.

These five species, as mentioned above under the *puberula* group, are not considered to belong with that group, even though both groups are put in the same key. The species of the *pilipennis* group, as do those of the *puberula* group, have fine dorsal pubescence (present or not in the strial punctures of the elytra, see fig. 69), the elytral costae usually obscured by large punctures, the clypeus more or less trapezoidal, and other similar characters. They differ by having the side margins of the clypeus not abruptly indented as in the *puberula* group; but shallowly, if at all, indented, then usually outwardly strongly sinuate to the front margin, which is narrow (figs. 73, 74), with the front angles dentiform or at least sharply angled. This kind of clypeus, which is often sexually dimorphic,

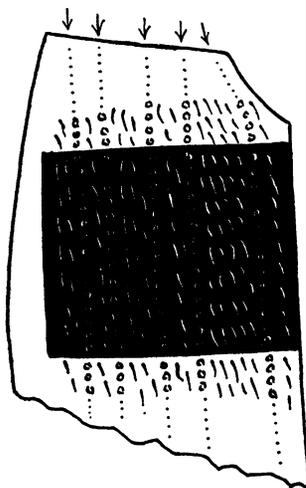


FIG. 69. Diagram of left elytron, showing position of hairless striae among hairy intervals.

and the general type of the male genitalia agree with most of the glabrous species of the *trapezifera* group, to which I believe the present group may be related.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Dorsal surface hairy, hairs of equal length. Eyes large, each about one-quarter, sometimes one-fifth, of the width of head. Antennae 10-segmented, the club usually longer than the combined funicular segments. Mandibles not large or stout. Pronotum with base transversely, narrowly impressed, front and hind angles not at all impressed. Scutellum variable within the species, densely punctured at the sides, at the base, or completely. Elytra with second interval multipunctate. Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium densely punctured. Front tibiae tridentate. Middle tarsi with first segment equal to or slightly longer than the second. Claws angularly bent, cleft subapically.

SEXUAL DIMORPHISM: It is rather difficult to distinguish the sexes, but the male usually has narrower hind femora, longer hind tarsi (longer than tibiae), and somewhat more transverse pygidium. Clypeus with front angles often sharper, more pronounced than in female. Males have the first hind tarsal segment narrower and longer than in female, but often shorter than the longer tibial spur.

A key to the species of the group, along with the *puberula* group, is given above. (See also table 4.)

DISCUSSION: The species of this group are small to medium-sized, measuring from 7 to 9 mm., reaching 11 mm. in *tarascana*. The hairs are yellow and semi-erect in all species but are absent from most (not all) of the strial punctures of the elytra, except in *selanderi* which has every puncture hairy. The species are all similar to one another. They occur on the Pacific Coast (in Durango and in Nayarit), or in the central or southern highlands, only *pilipennis* extending north to Chihuahua. None of the species has been taken as far north as the United States or farther south than Oaxaca. About 180 specimens, including Moser's type of *pilipennis*, have been examined.

A discussion of the male genitalia is given here instead of under each species.

These species have rather similar male genitalia but differ in a number of characters, such as the shape and amount of deflexion of the lateral lobes; the presence of a membranous keel dorsally near the apices which sometimes juts upward; the place of junction of the lateral lobes, whether in the basal third or half; and the shape of the eighth sternite. Some of these characters appear to be variable within the species, or at least they are difficult to standardize in dissections.

The genitalia of *zapoteca* (fig. 141) differ most from those of the other species; the lateral lobes are broad and straight nearly to the apices which are scarcely pointed and scarcely deflexed; there is virtually no space between the lobes when in repose. The lobes of *tarascana* (fig. 140) are about the same width up to the tapering apices which are long and pointed and without constriction. In *costanera*, *selanderi*, and *pilipennis* (figs. 137-139) the lobes are constricted on the outer side just before the apical points; in the latter two species they even turn outward again after the constriction. In *costanera* the apices are straight and contiguous on the inner side, whereas in *selanderi* and *pilipennis* they usually diverge somewhat (not always so markedly as shown in the figures). Membranous areas (not shown in the figures) are present dorsally on the inner apices of all species except *zapoteca* (they are very slight

in *tarascana*). These membranes, often paler in color than the lobes, may extend upward in the form of a keel; they often obscure or distort the shape of the apices. In *selanderi* and *costanera* the apical third of each lobe is flattened and more or less striate longitudinally (not shown in the figures), and this part is usually wider than the middle third of the lobe. In the other species there seems to be no widening or striation. There is some variation in how far from the base the lobes are joined, but they are usually joined farther from the base in *costanera* than in the other species.

The eighth sternite is consistently narrow and acuminate in *selanderi*, narrow but blunt at the tip in *costanera* and *zapoteca*, and wide and blunt in *tarascana* and *pilipennis*.

The internal sac is furnished with some bristles in *zapoteca* that are entirely lacking in *pilipennis* and *selanderi* (not studied in the other species).

***Diplotaxis pilipennis* Moser**

Figures 70, 74, 139

Diplotaxis pilipennis MOSER, 1918, p. 300 (Durango, Mexico; type, female, in Zoologisches Museum, Berlin).

DIAGNOSIS: Hairs present dorsally except in strial punctures of elytra. A narrow tawny species with the elytra at least three times longer than the pronotum. Very closely related to *costanera* (which follows), but differs from it by having much longer dorsal hairs (longer than any species in the group), smaller, shorter pronotum, lighter color, flat mentum, with no delimiting declivity in front, and different male genitalia.

RANGE: States of Chihuahua, Durango, and northwestern Jalisco in the highlands of northern Mexico. A total of 66 specimens has been examined. (See Appendix for localities, and fig. 70.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Color, yellow-brown. Length, 7 to 8.5 mm. Head with front descending abruptly to clypeus, sometimes front flattened or concave, densely punctured. Clypeus usually nearly as long as head, or half as long, trapezoid, front margin slightly reflexed, emarginate, angles bluntly dentiform or acute, sides oblique, usually

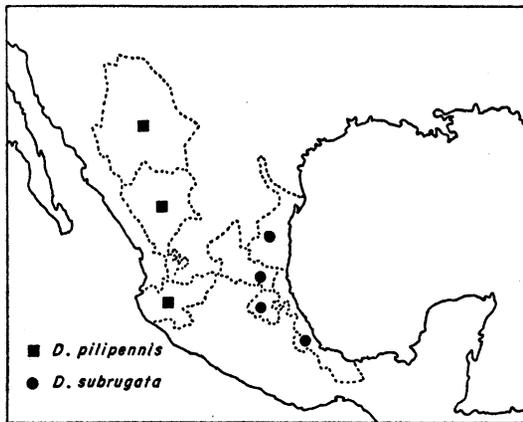


FIG. 70. Distribution of *Diplotaxis pilipennis* and *D. subrugata*.

sinuate, punctures dense, usually larger than those on head. Labrum flat, arcuate in front, densely punctate, same length as under side of clypeus. Mentum flat, the anterior declivity in apical fourth or fifth only weakly indicated posteriorly by nearly straight line of hairs. Palpi not impressed at base.

Pronotum flattened, sides strongly arcuate just behind middle, angles not produced, surface with punctures coarse, deep, usually larger and sparser than those on head, often quite irregularly spaced. Elytra with hairs lacking in strial punctures, hairs longer than distance between punctures, sometimes as long as twice the distance, dense, as large as on pronotum, costae usually obscured by dense large punctures, marginal hairs a trifle longer than dorsal hairs. Front tibiae with the three teeth equidistant and all placed in front of middle. Genitalia as in figure 139.

SEXUAL DIMORPHISM: Pygidium in male retracted, fifth abdominal segment at middle same length as fourth (longer than fourth in female).

REMARKS: The clypeus (fig. 74), although variable, is usually dentiform and has sinuate sides. It is not so sharply dentiform as in most specimens of *arizonica*, for instance, but more as in typical *trapezifera*. The legs and tarsi are quite hairy, although the tarsal hairs are not abundant enough to form pads as in the *puberea* group. The mentum in some examples, perhaps because of the exceedingly shining surface, seems to have no

declivity at all in front, but in most specimens a weak and broken edge can be discerned.

Although the type is from Durango and I have seen eight other specimens from that state, the majority of specimens examined are from Chihuahua. All material is from the highland plateau, including a small series (one male, seven females) from Etzatlan, Jalisco, about 40 miles west of Guadalajara, at 4000 feet. The type is a female and is somewhat larger and darker than my specimens; the sides of the clypeus are not sinuate as in most examples.

***Diplotaxis costanera* Vaurie, new species**

Figures 71, 73, 138

TYPE MATERIAL: Type, male, Tepic, Nayarit, Mexico, July 28, 1953, David Rockefeller expedition, 1953, C. and P. Vaurie, collectors, in the American Museum of Natural History. Twenty-four paratypes: one male, 11 females, with same data as type; two males, two females from San Blas, Nayarit, April 18, 1949 (G. M. Bradt); two males, two females from Mecatan, Nayarit, May 23, 1949 (G. M. Bradt); two males from Compostela, Nayarit, June, 1935, April, 1934; and two males from El Salto, Durango, 9300 feet, June 10, 1937. Paratypes are in the collections of the American Museum of Natural History; the University of California at Berkeley; Zoologisches Museum, Berlin; and the British Museum (Natural History).

DIAGNOSIS: Hairs present dorsally except in strial punctures of elytra. A coarsely punctured species very similar to *pilipennis* from the plateau but more robust, darker, larger, with larger, more convex pronotum, and a definite ridge on the mental declivity, which is slightly pushed forward, not flat as in *pilipennis*. Similar also to *tarascana*, but that species has the mentum flat, without apparent declivity, the pronotum usually more densely, finely, regularly punctured, and different male genitalia.

RANGE: The state of Nayarit on the Pacific coast of Mexico and inland to southwestern Durango (see fig. 71).

HABITAT: The type and 12 paratypes from Tepic were collected along with a couple of hundred *tepicana* Moser and some other species of the *trapezifera* group, also with

four of another hairy species (*simillima* Moser). A few of the specimens came to a lighted sheet on the ground, but the majority were picked from various weeds and thorny bushes in an abandoned field with the aid of a head lamp.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Color, dark red-brown. Hairs rather worn. Length, 8.5 mm. Head with front slightly concave behind clypeus, densely punctured. Clypeus nearly as long as head, front margin emarginate, strongly reflexed (by about one-third of length of clypeus), angles prominent, obtuse but sharp, sides oblique, scarcely sinuate, reflexed, punctures as dense as those on head but larger. Labrum as in *pilipennis*. Mentum with anterior declivity in apical third posteriorly arcuate, margined, and pubescent. Palpi as in *pilipennis*.

Pronotum with many hairs worn, convex, sides strongly arcuate behind middle, thence narrowing to front and hind angles which are not acute, surface with larger punctures than on head, sparse on disc, denser but irregular on sides. Elytra with hairs in interval, not in striae punctures, hairs scarcely longer than the distance between punctures, punctures dense, as large as those on pronotum, costae slightly convex, their dense punctures filling and obscuring them, marginal hairs two to three times longer than dorsal hairs. Front tibiae as in *pilipennis*. Genitalia as in figure 138.

SEXUAL DIMORPHISM: The same as in

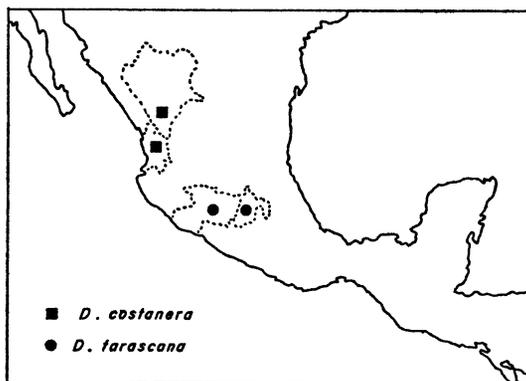


FIG. 71. Distribution of *Diplotaxis costanera* and *D. tarascana*.

pilipennis except that in the present species the hind tarsi are scarcely distinguishable between the sexes.

REMARKS: This is evidently a coastal species occurring at or near sea level (San Blas, Mecatan), as well as at Tepic and Compostela (about 3000 feet) and at El Salto, Durango, at about 9000 feet. In the last-named place *costanera* comes close to *pilipennis* which has been taken at Palos Colorados and Durango not far to the east of El Salto. The localities of Tepic and Compostela are also not far from Etzatlan, Jalisco, where *pilipennis* occurs.

The length in the paratype series ranges from 7 to 9.5 mm. Three of the specimens from San Blas and one of the two from Compostela are slightly paler in color than the remaining ones, but not so tawny as *pilipennis*. Some specimens resemble superficially an atypical series of *tarascana* from Los Reyes, Michoacan, which have the pronotum rather sparsely punctured as in *costanera*. The majority of paratypes are so worn that the hairs on the head and pronotum are not noticeable unless viewed in profile; on the few examples that are not so abraded, the hairs are seen to be shorter than in *pilipennis*, and about the same as in *tarascana*. In the females the front margin of the clypeus is virtually straight, whereas in the males it is distinctly indented at the middle; the angles are sharper in the male and the clypeus is more broadly reflexed (fig. 73). This sexual difference, however, is not always well marked. The male genitalia, extracted from 10 specimens, are nearly identical except for those of the two specimens from Durango, which apparently lack the flattened, striate area. (See discussion of genitalia under the group, above.)

***Diplotaxis tarascana* Vaurie, new species**

Figures 71, 140

TYPE MATERIAL: Type, male, Temascaltepec, Mexico, Mexico, June 3, 1954, 5700 feet, R. K. Selander, collector, in the American Museum of Natural History. Twenty-seven paratypes as follows: with same data as type, one male, three females; Temascaltepec, 1931, two males, two females; Tejuipilco, Temascaltepec, 1932, one male; from Michoacan: Tuxpan, July 11, 1951, one male, three

females; 25 kilometers east of Morelia, June 14, 1955 (R. B. and J. Selander), at light, one male; 3.5 miles northwest of Tzitzio, June 6, 1954, 6000 feet (R. K. Selander) at light, three males, three females; 2 miles east of Los Reyes, May 31, 1945 (W. H. Burt), five males, two females. Paratypes are in the collections of the American Museum of Natural History, the California Academy of Sciences, the University of California at Berkeley, R. B. Selander, the University of Michigan, and the British Museum (Natural History).

DIAGNOSIS: Hairs present dorsally except in strial punctures of elytra (parts of some striae, however, have hairs). Differs from *costanera* from the coast by having the mentum flat, not declivous in front, the labrum shorter. Generally similar also to *selanderi* from Michoacan, but with at least some of the strial punctures hairless (most often those on the suture), the pronotum larger, its sides not constricted or sinuate at base.

RANGE: Central highland of Mexico in the states of Michoacan and Mexico. A male from Chiapas with no further locality and no date may have been labeled in error; it is not included among the paratypes. (See fig. 71.)

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Color, red-brown. Length, 9 mm. Head as in *pilipennis*, with front concave. Clypeus about one-half of the length of head, front margin slightly emarginate, strongly reflexed, angles broadly, bluntly dentiform, sides oblique, sinuate; punctures dense, larger than those on head. Labrum, mentum as in *pilipennis*, but labrum shorter than under side of clypeus, and sides of labrum more prominent. Palpi with faint flattened basal area.

Pronotum as in *pilipennis*, except that the punctures are dense, not sparse, and scarcely larger than those on head. Elytra with hairs in punctures of intervals and in occasional strial punctures, especially near apex, hairs longer than distance between punctures, punctures so dense all over that costae cannot be discerned except by tipping backward the specimen to see where the hairs are lacking, marginal hairs about twice as long as dorsal. Front tibiae with basal tooth nearly at middle. Genitalia as in figure 140.

SEXUAL DIMORPHISM: As in *pilipennis*.

REMARKS: The central highland region where this species occurs corresponds to the Transverse Volcanic Biotic Province of Goldman and Moore (1945) and the Austro-occidental Province of Smith (1949). The former authors say that in this "southern and highest part of the interior plateau . . . the full play of natural forces has favored the evolution or survival of a remarkable number of genera, species, and regional races." In the present study I have found that many new and often perplexing forms come from just this area which has recently been well collected by Dr. and Mrs. Richard B. Selander, Dr. Robert K. Selander, and others.

The present species has a number of local variations, and it is possible that it is composed of more than one species. The three males from Tzitzio and the single male from Morelia, in Michoacan, have the hind tibiae and the segments of the front tarsi proportionately shorter and wider than other males from the state of Mexico (including the type), and from Tuxpan and Los Reyes, Michoacan; they also have the hind tibiae rather bent just before the apex, as in *pilifera* Burmeister. These localities are not very far apart in northern Michoacan, being on or near the Guadalajara to Mexico City highway. Temascaltepec is farther to the east. All other characters, including the male genitalia, appear to be similar, as also the females, so I consider these forms to be conspecific. The series of five males and two females from Los Reyes (situated west of Morelia and of Lake Patzcuaro) differ from the other paratypes by having much sparser punctation on the pronotum (more as in *costanera*), the sides of the clypeus scarcely or not at all sinuate, and the angles not markedly dentiform. Two of these individuals have so many of the strial punctures hairy instead of bare that at first glance they seem to be entirely hairy. One of the peculiarities of this species is this inconstancy of the bare strial punctures; one might readily mistake some specimens for a species with all punctures hairy, as *selanderi* or some of the species of the *puberula* group. Of 27 specimens, however, all have at least some definite portions of the striae with the punctures bare of hairs, whereas, of 31 *selanderi*, none has

bare striae. The row of punctures next to the sutural interval and the last row at the edge of the elytra are the ones on which the hairs are usually lacking in *tarascana*; there seems to be a tendency for the central striae to have scattered hairs. The clypeus in this species varies also, from the emarginate front margin, sinuate sides, and dentiform angles present in the type to the truncate margin, more or less straight sides, and angulate but not dentiform angles of some of the other specimens (some of which is, of course, owing to wear). Each eye is only one-quarter of the width of the head in some males, but one-fifth in others.

This is the largest species of the group, some specimens reaching 11 mm., although one of the paratypes is only 8.5 mm. (For discussion of the genitalia, see under the group, above.)

***Diplotaxis selanderi* Vaurie, new species**

Figures 66, 72, 137

TYPE Material: Type, male, 25 kilometers east of Morelia, Michoacan, Mexico, June 14, 1955, at light, R. B. and J. M. Selander, collectors. Twenty-nine paratypes as follows: with same data as type, 11 males, seven females; 15 miles east of Morelia, at junction of Highway 4 and Huetamo Road, 2100 meters, July, 1947 (T. H. Hubbell), one male; Morelia, 1886 meters, June, 1947 (T. H. Hubbell), six males; "Michoacan," two males, one female; from Jalisco, environs of Guadalajara, 1903 (L. Diguët), one female. The

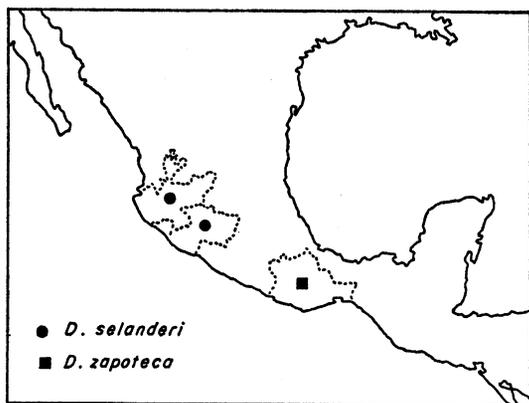


FIG. 72. Distribution of *Diplotaxis selanderi* and *D. zapoteca*.

type and some paratypes are in the American Museum of Natural History; other paratypes are in the collections of R. B. Selander; University of Michigan; Instituto de Biología, University of Mexico; Muséum d'Histoire Naturelle, Paris; and the University of California at Berkeley.

DIAGNOSIS: Hairs present in all dorsal punctures. General appearance as in the other species of the group, but differing from them by having hairs in all the elytral punctures, not just those of the intervals, and the base of the pronotum rather sinuate or constricted in front of the angle, thus forming a rather acute, sometimes blunt, tooth (fig. 66).

RANGE: Known only from Michoacan and Jalisco in the highlands of south central Mexico (see fig. 72).

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Color, dark red-brown, head and pronotum darker than elytra. Length, 8.5 mm. Head as in *pilipennis*, with front flattened. Clypeus more than one-half of the length of head, front margin emarginate, reflexed, angles acutely dentiform, sides oblique and sinuate, punctures dense, larger than those on head. Labrum as in *pilipennis*, but sides prominent. Mentum flat, but with slight anterior declivity that is posteriorly arcuate, weakly margined, and pubescent. Palpi as in *pilipennis*.

Pronotum as in *pilipennis*, except that the punctures are as fine and almost as dense as on head, and the sides at base are sinuate. Elytra with hairs in every puncture, hairs longer than distance between punctures, punctures denser and larger than on pronotum, costae nearly obscured by dense, large punctures, marginal hairs three times longer than dorsal ones. Front tibiae as in *pilipennis*. Genitalia as in figure 137.

SEXUAL DIMORPHISM: Same as in *pilipennis*, except that there seems to be no appreciable difference in the relative length of the fourth and fifth abdominal segments.

REMARKS: This species is named for Dr. and Mrs. Richard B. Selander, the collectors, who have not only collected, but also generously donated to the American Museum, many specimens of *Diplotaxis* from their various expeditions to Mexico.

There are only two other hairy species with

the combination of the same three characters as this one, i.e., hairs in all elytral punctures, abdomen not ridged, and labrum neither long nor large. They are *coriacea* Bates, from the west coast of Mexico, a tiny species with prominently advanced, quadrate, not dentiform, clypeus, and very bulging pronotal sides (fig. 93), and *puncticollis* Moser from eastern and southern Mexico and Guatemala, which has the elytral hairs of unequal length, those on the suture being usually very long, and different clypeus. These two species are in the *puberula* group.

In addition to the more hairy elytra, *selanderi* differs from *costanera* in the fine, dense, uniform pronotal punctures and in the dentiform, not merely angulate, clypeus, with sinuate side margins. It seems most closely related to *tarascana*, which has been collected also in Morelia, differing from it by having the hind angles of the pronotum constricted, and the clypeus narrower, not so broad, in front, its angles more sharply and narrowly dentiform, and the labrum slightly different (but difficult to define). The male genitalia differ also (see discussion of group, above), and there is a slight difference in the front tibiae which in *selanderi* have the basal tooth farther front, not so median, than in *tarascana*. Of 16 males of *selanderi* dissected, all have the eighth sternite consistently narrower and more attenuate than the other species of the group.

About half of the paratypes, and the type, have the pronotal hind angles constricted as shown in figure 66; the others have them obtuse in outline and with only a tendency towards constriction; a few have them no different from those of *tarascana*. Many of

the paratypes, when seen under a lighted microscope, have the head and pronotum more or less black and the elytra lighter, reddish, in color. The size range in the series is from 8 to 9.5 mm. An oval flattened area at the base of the terminal segment of the maxillary palpi can be seen on some of the paratypes in the proper light, but it is not visible on the type. It is not an actual depression as in many species of the genus.

***Diplotaxis zapoteca* Vaurie, new species**

Figures 72, 141

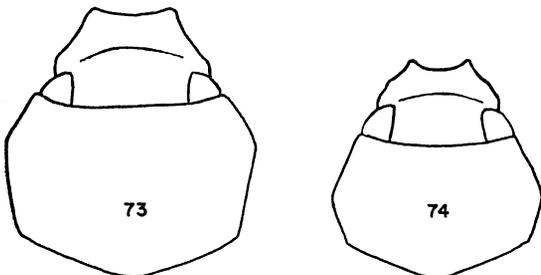
TYPE MATERIAL: Type, male, Oaxaca, Oaxaca, Mexico, 5084 feet, July 1-2, 1955, P. and C. Vaurie, collectors, in the American Museum of Natural History. Nineteen paratypes (five males, 14 females), same locality and collectors, but various dates, July 1-2, 4, 14, and 16, 1955, and 46, same locality, but collected April 13, 1953, by R. C. Bechtel and E. I. Schlinger; also five from 3 miles southeast of Tule, Oaxaca, same collectors, April 12, 1953. Paratypes are in the American Museum of Natural History, the University of California at Berkeley, the California Academy of Sciences, and the British Museum (Natural History).

DIAGNOSIS: Hairs present dorsally except in striae punctures of elytra. Differs from the preceding four species by having the clypeus markedly quadridentate (as in the right-hand figure of fig. 16) and the front margin between the forward teeth much narrower than in the other species; also by having a larger pygidium.

RANGE: Known only from Oaxaca, southern Mexico (see fig. 72).

HABITAT: The type and paratypes, along with about 900 others of the genus (eight or nine species), were picked from low trees on various nights with the aid of head lamps. The trees were on a hillside overlooking the city of Oaxaca; there were young planted pepper trees and the feathery "ear tree" called *cuanacaztle* in Oaxaca (*Enterolobium cyclocarpum*). The only other hairy species taken here proved also to be a new species, *spina* of the *puberea* group.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Color, dark red-brown. Length, 9 mm. Head with front descending abruptly



FIGS. 73, 74. Head and pronotum, slightly tipped backward, of males of the *pilipennis* species group. 73. *D. costanera*. 74. *D. pilipennis*.

to clypeus, at middle broadly concave behind clypeus, densely punctured. Clypeus nearly as long as head, quadridentate, front margin deeply emarginate between acute teeth, side margins each with a strong sinuation almost as large as the teeth on the front margin, all margins strongly reflexed, punctures dense, larger than those on head. Labrum as in *pilipennis*, but with sides slightly prominent. Mentum flat, but with slight anterior declivity that is posteriorly arcuate, weakly margined, and pubescent. Palpi hidden in type; paratypes have basal flattened area.

Pronotum with sides strongly arcuate behind middle, front and hind angles rounded off, surface covered with dense punctures about the size of those on head. Elytra with hairs in punctures of intervals, strial punctures bare, hairs longer than distance between punctures, punctures dense, larger than on pronotum, costae with slightly smaller punctures than other intervals, marginal hairs about three times longer than dorsal ones. Front tibiae with basal tooth nearly at middle. Genitalia as in figure 141.

SEXUAL DIMORPHISM: As in *pilipennis*, except that pygidium is scarcely retracted in male, and fourth and fifth abdominal segments are same length in both sexes.

REMARKS: The four clypeal teeth resemble those present in *Diploptaxis denticeps* Bates of the *trapezifera* group. In fact the strongly sinuate side margins of the clypeus of many of the *trapezifera*-like species show tendencies towards teeth, or perhaps the teeth are becoming obsolete in them. *Diploptaxis zapoteca* is, in fact, extremely similar to a series of *denticeps* Bates from Morelia, Michoacan, and from Temascaltepec, Mexico, only differing by being hairy, not glabrous, above, by having the marginal hairs of the elytra three times longer than the dorsal ones, not short, and different male genitalia.

The size range among the paratypes is from 8 to 9.5 mm. In some individuals the clypeus is shorter than in the type, being only one-third of the length of the head; in some the sides of the clypeus are strongly sinuate, but not dentiform; in five or six the edges of the clypeus are worn, thus flattening the dentiform angles. The mentum is often quite flat. The head is often black or darkened and usually has a median depression as in the

type. Some of the paratypes are entirely piceous, and a few have piceous areas along the middle of the dorsum or on the pronotum; the remaining are red like the type. The male genitalia (fig. 141) are discussed above with the group. The internal sac contains some short bristly hairs or scales, somewhat as in *pilifera*, a quite different species.

In contrast to *tarascanana*, in which a number of individuals have some hairs in the strial punctures of the elytra, all specimens of *zapoteca* lack hairs in the striae.

In addition to the paratypes, about 20 additional specimens have been examined, from Oaxaca, Oaxaca, collected by Bechtel and Schlinger, April 13, 1953.

SPECIES GROUP *arizonica*

Diploptaxis arizonica Schaeffer

Figures 75, 142

Diploptaxis arizonica SCHAEFFER, 1907, p. 63 (Huachuca Mountains, Arizona; type, in United States National Museum).

DIAGNOSIS: Head and pronotum virtually glabrous, clypeus and elytra hairy, elytral costae virtually impunctate, abdomen ridged. The only hairy species with impunctate costae. The male is unique in the prolongation of the inner apex of the middle tibiae.

RANGE: Southern Arizona, mostly in the mountains, and northern Chihuahua, Mexico, only 18 of the 400 or so specimens being from Mexico. (See Appendix for locality data.)

HABITAT: A specimen from Sycamore Canyon, Arizona, was taken on *Quercus emory* in August, and four specimens from Patagonia were taken on *Acacia greggii* in July.

DESCRIPTION: Length, 6.5 to 8 mm. Color, dark red to black. Head with or without a slight transverse ridge behind clypeus, top of head usually with impunctate area, head and clypeus with dense, small punctures. Clypeus hairy in front, about one-half of length of head, truncate or slightly emarginate in front between distinctly dentiform, acute angles, sides strongly sinuate, often appearing also dentiform, margins slightly reflexed. Eyes small, each about one-fifth or less of width of head. Antennae 10-segmented. Palpi with flattened basal impression on last segment. Mandibles not large. Labrum short, no longer than reflexed under side of clypeus, scarcely

curved in front, slightly concave at middle, the sides rather prominent. Mentum flat, the usual anterior declivity indicated only by a few hairs.

Pronotum apparently without hairs, punctures same size as those on head and clypeus, but sparser on disc, sides strongly arched behind middle, thence somewhat sinuate to the acute front angles, hind angles obtuse, sides sometimes slightly sinuate or constricted in front of hind angles, base punctured at middle, not at sides. Scutellum sparsely or densely punctured. Elytra with short, semi-erect yellow hairs in all but sutural punctures, hairs longer than distance between punctures, punctures larger than on pronotum, often very irregularly spaced, sutural punctures very small if present; second interval usually unipunctate basally, with irregular single or double rows apically, costae convex, distinct, impunctate (occasionally a puncture here and there); marginal hairs as long as base of scutellum is wide.

Abdomen at sides with strongly elevated chitinous ridge extending from base to the edge of pygidium; fifth segment with groove and ridge above pygidium. Pygidium densely punctured. Metasternum slightly depressed. Front tibiae with basal tooth farther removed from other teeth and near middle of tibiae. Middle tarsi with first segment longer than second; hind tarsi not longer than hind tibiae. Claws bent angularly, toothed subapically. Genitalia as in figure 142.

SEXUAL DIMORPHISM: Male with inner apex of middle tibiae prolonged (fig. 75) so as to form acute triangle, this apical portion of tibiae impunctate. Male with first segment of hind tarsi about as long as longer of tibial spurs, female with it shorter. Male with pygidium usually more transverse. Female with hind tarsi shorter than hind tibiae.

REMARKS: It is difficult to place this species; it might belong with or near a number of groups. The dentiform clypeus, and even the labrum and mentum, are typical of many species of the *trapezifera* and *pilipennis* groups, but the large pygidium, the pygidial groove, and the ridged abdomen have not been found in those groups. The ridged abdomen and the impunctate elytral costae would seem to ally it with the *arctifrons-truncatula* group, although none of the species of

this group has dorsal hairs; the lobes of the male genitalia are similar to those of this group, but the internal sac has a dark pattern not present in the other species.

This abundant species is readily identifiable by the characters given in the diagnosis. The character of the male, that the apex of the middle tibiae is prolonged, impunctate, and flattened, has not been recognized in any others of the genus, although some species have the apices of the first tarsal segments prolonged. Schaeffer makes no mention of this in his description although, according to Cazier (*in litt.*), the type is a male. The pro-



Fig. 75. Left middle tibia of *Diplotaxis arizonica*, male, showing inner projection of apex.

jection is more marked in specimens from the United States; about half of the specimens from Mexico have the projection only partially prolonged.

The impunctate costae or narrow intervals occasionally have one or two scattered punctures, but when present they have no hairs in them. The clypeus varies quite a bit individually, the dentiform angles being sometimes more widely spaced, the front margin either feebly or strongly emarginate. The dark coloration is quite constant, only three or four of 380 specimens being red-brown instead of appearing black. The Chihuahua records are the first to be reported from Mexico.

Other hairy species with the abdomen ridged laterally are *cavifrons* (head excavated; Guatemala, southern Mexico), *cribulosa* group (labrum bilobed), and *guatemalica*, *poropyge*, and *rugosifrons* (elytral costae distinctly punctured). All of these, however, have hairs on the costae.

SPECIES GROUP *aurata**Diplotaxis aurata* Bates

Diplotaxis aurata BATES, 1889, p. 398, pl. 24 (Panzos, Verapaz, Guatemala; type, male, in British Museum).

DIAGNOSIS: Elytral hairs long, sparse, wispy, absent from striae punctures; abdomen not ridged; claws tiny. The elytra on the unique specimen have a dull, aeneous finish and appear smooth, although their surface is actually finely reticulated; there are many tiny punctures as well as many impunctate areas, and the irregular rugose swellings branching off from the convex costae give an unusual, rather mottled effect.

RANGE: Known only from the type locality, Panzos, in the department of Alta Verapaz, in the eastern lowlands of Guatemala, on the Polochic River which flows into Lake Izabal.

DESCRIPTION OF TYPE, MALE: Length, 10 mm. Color, aeneous. Head with but two or three short hairs visible, front sloping obliquely to clypeus, densely punctured. Clypeal suture obliterated at middle. Clypeus with a few hairs, almost as long as head, broadly rounded in front and only slightly emarginate at middle, margins broadly, shallowly reflexed, side margins slightly sinuate, punctures as on head. Each eye about one-quarter of width of head. Antennae 10-segmented. Maxillary palpi without dorsal impression on last segment. Mandibles small. Labrum more or less flat, but raised above the reflexed under side of clypeus, longer than that part, apparently impunctate (dirty). Mentum with anterior declivity in apical third posteriorly margined, pubescent, and arcuate.

Pronotum transverse, with short, depressed hairs that are not longer than space between punctures, latter sparser than on head, sides strongly margined, arcuate near middle, front and hind angles obtuse. Scutellum densely punctured on each side. Elytra about four times longer than pronotum, the hairs long, erect, wispy, four times longer than hairs of pronotum, hairs lacking in striae; punctures smaller than those on pronotum, sparse except on striae where they are dense; second interval multipunctate; costae convex, with larger punctures that are

very widely separated; marginal hairs same length as dorsal hairs.

Abdomen not ridged laterally, fifth segment without groove. Middle and hind tarsi with first two segments about equal in length, hind tarsi at least as long as hind tibiae. Front tibiae with three outer teeth well in front of middle. Claws bent angularly, cleft subapically, tooth as long as apex of claw.

SEXUAL DIMORPHISM: No female available for comparison. Male has fifth abdominal segment shorter at middle than fourth; hind femora virtually straight and very narrow; hind tibiae also straight and narrow but with slight apical flare; setose carinae on hind tibiae very weak.

REMARKS: Bates called this a "distinct and easily recognizable species," with which I agree. No other species has the elytra as here (see diagnosis). The head and clypeus recall *rita* in shape, but there is no transverse swelling on the head. *Diplotaxis poropyge*, also from Guatemala as well as from farther south, has much shorter, more abundant, elytral hairs, much larger pronotum, and larger, coarser elytral punctures. The fine, exceedingly long, sparse, elytral hairs are probably diagnostic of the species *aurata*, but the amount of variation cannot be judged until other specimens have been seen. It is somewhat similar to *alutacea*, *carinifrons*, and *aereomicans* of the *simplex* group in the male genitalia (dissected, but not illustrated) and in the short pronotum and non-angulate clypeus, but the labrum is not the same, and these species are virtually glabrous. The claws on the type specimen are very small and short, those on the hind tarsi being less than one-half of the length of the claw segment, much as in *jamaicensis* of the *simplex* group. The tarsi, tibiae, and femora are all long and slender.

Until additional specimens have been examined, this species will stand by itself.

SPECIES GROUP *simplex*

The following species are included in this group: *Diplotaxis alutacea* Bates; *carinifrons* Bates; *aereomicans* Moser; *jamaicensis* Cazier; *metallescens* Bates; *fossifrons* Moser; *simplex* Blanchard; and *rita*, new species.

These are glabrous or minutely hairy species of central or southern Mexico and Guat-

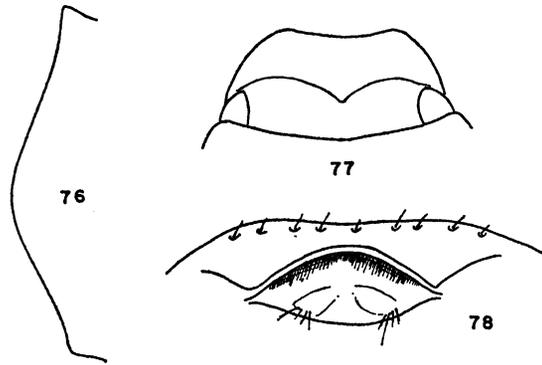
emala, from 7 to 12 mm. in length, and are characterized principally by a large-sized labrum (usually more than twice longer than the reflexed under side of the clypeus), large mandibles, and usually by the fact that the head behind the clypeus is impressed at the middle or carinate or both. Three of the species are large (*aereomicans*, *fossifrons*, *rita*); the rest are rather small. The clypeus has rounded lateral angles in all, with the front margin straight or but slightly emarginate.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Surface dorsally glabrous except on the elytra of *alutacea* and *jamaicensis*. Eyes moderate in size, each about one-fifth of width of head, but about one-quarter in *simplex*. Antennae 10-segmented. Maxillary palpi without basal impressed area on last segment. Mandibles large, in some specimens almost as long as labrum, but not so large in *simplex*. Elytra with marginal hairs short, sparse (longer in *aereomicans*). Front tibiae tridentate, the three outer teeth close together and well in front of middle. Middle tarsi with first segment equal to or slightly longer than second. Claws angularly bent, cleft subapically.

SEXUAL DIMORPHISM: See under each species. Most males have narrower hind femora than females, longer first hind tarsal segments, narrower hind tibial spurs, more transverse pygidium, and longer hind tarsi.

KEY TO THE SPECIES OF THE *simplex* GROUP

1. Abdomen ridged or carinate at sides under edge of elytra 2
Abdomen at sides smoothly rounded 3
2. Pronotal punctures on disc fine, sparse; punctures on outer rows of elytra large and foveate; Puebla, Mexico *aereomicans*
Pronotal punctures on disc coarse and dense; punctures of elytra normal, not foveate, Jamaica, British West Indies *jamaicensis*
3. Elytra with fine short hairs on narrow intervals and on subapical callosities (seen by tipping back specimen); pronotal sides sinuately constricted at base; Guatemala (fig. 76) *alutacea*
Elytra without dorsal hairs; pronotal sides not constricted at base 4
4. Clypeus tumid or swollen in front of suture, especially at middle (fig. 82) *simplex* (in part)
Clypeus not tumid at middle 5



FIGS. 76-78. The *simplex* group of *Diplotaxis*. 76. Sides of pronotum of *D. alutacea*. 77. Head of *D. metallescens*, showing bent-back clypeal suture. 78. Labrum of *D. alutacea* and reflexed under side of clypeus.

5. Clypeal suture bent back angularly at middle, often with small depression at apex of angle; head not transversely carinate (fig. 77) 6
Clypeal suture either straight at middle or not visible among punctures; head behind clypeal suture transversely carinate, at least at sides (fig. 83) 8
6. Front of head (viewed from above) with an elevated shelf or frown following angular contour of clypeal suture; sides of pronotum abruptly angulate at or behind middle *metallescens*
Front of head flat or depressed, not elevated 7
7. Size small (7 to 8 mm.); second abdominal segment at middle often with sharp carina or tubercle; clypeus with front margin virtually straight and densely, entirely punctured; labrum flat; central and southern Mexico; Guatemala *simplex* (in part)
Size large (9.5 to 10.5 mm.); second abdominal segment not carinate or tuberculate; clypeus with front margin sinuate, and with the punctures rather sparse, at least at center; labrum hollowed out; states of Hidalgo and Puebla, in east central Mexico *fossifrons*
8. Size small (7 to 8.5 mm.); pronotum densely punctured, punctures touching, sides with two distinct round depressions one in front of other (fig. 94) *carinifrons*
Size large (10 to 10.5 mm.); pronotum very irregularly and sparsely punctured, sides with one, if any, round depression (fig. 83) *rita*

DISCUSSION: The species of this group are not so homogeneous as the species of some of the other groups, but there appears to be an

interplay of characters to link them together. The first three species and most individuals of the fourth species have the labrum almost identical (long, wide, with surface irregularities as described under *alutacea*), very large mandibles, and bisinuate mentum, characters found in some species at least of the Old World genus *Apogonia*, which is very similar to *Diplotaxis*. In the other species of this group the labrum is just as large, but is flat and smooth in *metallescens* and rather concave in *fossifrons*, the mandibles are large in both, but the mentum is sinuate in the former only. The last two species (*simplex* and *rita*) have the labrum not so markedly large and not so long in all individuals, and the mandibles not so large in *simplex*. In *simplex* as well as in *fossifrons* and *metallescens* and very slightly in *aereomicans* the clypeal suture is bent back angularly at the center, with sometimes a triangular or round shallow depression on the head behind the angle. Half of the species, including two among the first four mentioned above, have a transverse ridge or carina, often partially obsolete at the middle, on the front of the head behind the clypeus. Both *jamaicensis* and *aereomicans* have the abdomen ridged laterally, and *aereomicans* and *alutacea* have the subapical callosities of the elytra quite sharp and prominent.

With the exception of *simplex*, which ranges from Tamaulipas south into Chiapas and Yucatan, the species are rather restricted in distribution: one to Guatemala, two to Guatemala and Chiapas, Mexico, one to Puebla, one to Puebla and Hidalgo, one to Michoacan and Oaxaca, and one to Jamaica in the West Indies. The only species abundant in collections is *simplex*, of which about 750 specimens have been examined, of which at least 700 were collected by me and my husband; only about 60 specimens have been seen of the other species. All the types have been examined.

There are other species that have the labrum as large: some of the species of the *puberula* group, which are dorsally hairy; the *harperi* group from the United States, especially *punctatorugosa* which has the forehead carinate as in *carinifrons*; and the *ingenua-marginicollis* group, especially *maura* (Texas and Tamaulipas) and *decima* (Chiuhua and Durango).

Diplotaxis alutacea Bates

Figures 76, 78, 143

Diplotaxis alutacea BATES, 1889, p. 398, pl. 24, fig. 12 (no type locality designated, but the type, female, is from Coban, Verapaz [Alta Verapaz], Guatemala, in British Museum).

DIAGNOSIS: Hairs present on elytral costae; abdomen and forehead not ridged. Pronotum in front with oblique lateral impressions; subapical callosities prominent. A densely and coarsely punctured species quite similar to *carinifrons* but lacking the transverse carina on the head. Differs from *aereomicans* chiefly in the absence of the abdominal ridge and much smaller size; differs from all but *jamaicensis* by having hairs in the punctures of the narrow elytral intervals, most noticeable apically.

RANGE: Guatemala. Only three specimens have been examined: the type, a female, from Coban, Alta Verapaz, and a male and female from Capetillo, Sacatepequez, on the Pacific slope, both localities in the highlands.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 9 to 10 mm. Head densely, confluent punctured, surface rough, clypeal suture obliterated at middle. Clypeus about one-third of length of head, punctured as on head, trapezoid, front margin straight, angles rounded, sides not sinuate. Labrum nearly three times longer than, and front edge on same level as, the reflexed under side of clypeus, with a shallow impression behind the front edge and following its contour, and a weakly elevated triangular area behind; finely, densely punctured, front margin slightly arcuate. Mentum with long declivity in anterior two-thirds, its surface bisinuate, posterior margin also sinuous, weakly margined.

Pronotum only slightly longer than head and clypeus combined, transverse, with transverse depressions at front on each side and across base, surface rough and punctured as on head, sides strongly subangulate and arcuate at middle, thence sinuate to front and hind angles which are right angles. Scutellum densely punctured. Elytra a little more than three times longer than pronotum, with very short hairs in the punctures of the five narrow intervals; second interval multipunctate, costae, including sutural interval,

scarcely discernible because of dense confluent punctures; subapical callosities prominent, sometimes very sharp, pinched, and with a few hairs.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium densely punctate. Genitalia as in figure 143.

SEXUAL DIMORPHISM: Male with fifth abdominal segment at middle shorter than fourth, female with it same length; male, first hind tarsal segment as long as longer of tibial spurs.

REMARKS: This species and *jamaicensis* are the only ones in the group with hairs on the elytra. Bates does not mention dorsal hairs, but they are distinctly visible on the narrow intervals and callosities on his type. With so few specimens, it is impossible to state the range of variation in the above and other characters. The head, pronotum, and clypeus appear hairless. The male from Capetillo has the apical callosities strikingly protruding because they are deeply undercut. The lobes of the male genitalia are joined at the middle and resemble those of *carinifrons* (fig. 143) which follows.

***Diplotaxis carinifrons* Bates**

Figures 80, 94, 143

Diplotaxis carinifrons BATES, 1889, p. 398 (type locality not designated, but type, male, is from Panzos, Verapaz [Alta Verapaz], Guatemala, in British Museum).

DIAGNOSIS: Glabrous, abdomen not ridged, forehead ridged. Labrum same as that of *alutacea* and of *aereomicans*. Mentum same as that of *alutacea*, to which the present species seems to be more closely allied. The species differs from both *alutacea* and *aereomicans* in the interrupted transverse carina on the front of the head behind the clypeus, and in the broader, more angulate clypeus, with its indented side margins. Pronotum exceedingly short (fig. 94).

RANGE: Both coasts of Guatemala; also Chiapas in southern Mexico. A total of 24 specimens was examined: the type from Panzos in the lowlands of eastern Guatemala; eight specimens from Tikal in the Peten, Guatemala, May, 1956; 12 specimens from "Mexico"; and three specimens from 4 miles southwest of Simojovel in central Chiapas, northeast of Tuxtla Gutierrez,

March, 1953. Bates mentions also an example from Capetillo, on the west coast of Guatemala. (See fig. 80.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 7.5 to 9 mm. Head densely punctured, transversely carinate behind clypeus, the carina, which extends also over the eyes, becoming obsolete at middle of head; clypeal suture obsolete at middle. Clypeus trapezoidal, about one-half of the length of the head, punctured as on head, front margin straight or slightly emarginate, broadly reflexed, its angles broadly rounded, side margins emarginate, often strongly indented, in front of eyes. Labrum and mentum as in *alutacea*.

Pronotum scarcely longer than head and clypeus combined, transverse, punctures about same size and density as those on head, but often sparser on disc, sides strongly angulate behind middle, thence oblique to obtuse hind angles and to right-angled front angles, sides in front with two rounded depressions, base impressed transversely and with an impunctate space in front of margin; scutellum densely punctured. Elytra scarcely three times longer than pronotum, densely punctured with same kind of punctures as on pronotum, costae obscured by punctures, second interval multipunctate, subapical callosities normal.

Abdomen not ridged laterally, fifth segment without groove. Pygidium densely, rugosely punctured. Genitalia as in figure 143.

SEXUAL DIMORPHISM: Female with hind tibial spurs thicker than in male and hind first tarsal segment shorter and broader. Pygidium and fifth abdominal segment do not show much difference between the sexes.

REMARKS: Unlike the other species of the group, this species has a transverse impunctate area or line, not always well marked, across the base of the pronotum, very similar to the depression characteristic of *harperi* and *blanchardi* in the United States. The punctuation of the pronotum varies in density, two of the three individuals from Chiapas having it sparser than the others. The pronotum is very short in comparison with the length of the head and clypeus; the pronotal sides are so short that they are scarcely longer than the diameter of the eye (fig. 94). The clypeus has the front

margin more strongly reflexed, the sides indented, and the clypeus more trapezoid in shape than in the related species. The frontal carina is also more marked. The lobes of the male genitalia (fig. 143) are narrow throughout, joined on the inner side at about the middle; the apices are only gently turned down as in *alutacea*.

***Diplotaxis aereomicans* Moser**

Figure 143

Diplotaxis aereomicans MOSER, 1918, p. 316 (Necaxa [Puebla], Mexico; type, male, in Zoologisches Museum, Berlin).

DIAGNOSIS: Glabrous, abdomen ridged, forehead not ridged. A unique species in a number of characters. The labrum is large and impressed as in the two preceding species, but *aereomicans* is usually larger (12.5 mm.), with a greenish coppery sheen (hence its name), has the abdomen ridged, unusual elytra with large shallow impressions instead of normal punctures, and virtually no costae. As in *alutacea*, the pronotal sides are sinuate and constricted at base and the subapical callosities of the elytra are rugose and sharply prominent.

RANGE: Known only from Necaxa in the state of Puebla, southeastern Mexico. The type, a male topotype, and a male from "Mexico" are the only specimens examined.

DESCRIPTION OF MALE: (See diagnostic description of group for characters omitted here). Length, 10 to 12.5 mm. Head densely punctured, clypeal suture distinctly bent back angularly at middle. Clypeus more than one-half of the length of the head (nearly as long as head in type), punctured as on head, slightly swollen at middle base, front margin shallowly reflexed, virtually straight, angles rounded, side margins straight. Labrum as in *alutacea*. Mentum declivous in anterior third, the declivity posteriorly arcuate, margined, and pubescent, center of declivity at base seems slightly sinuate or tumid.

Pronotum with greenish sheen, only slightly longer than head and clypeus combined, punctures smaller than on head and very sparse except near front or hind angles where they are larger and dense; sides arcuate at about middle, thence sinuate and constricted to obtuse hind angles and evenly rounded to front angles which are small and

somewhat acute, center of pronotum sometimes with longitudinal crease (not present in type); scutellum sparsely punctured at base. Elytra with coppery reflections, about three times longer than pronotum; as finely, sparsely punctured as on pronotum on the first interval, but other intervals have large shallow impressions around punctures, sometimes definitely elongate, not round; second interval unipunctate in front, costae flat and indicated only by series of tiny punctures; marginal hairs sparse but longer than in others of group; subapical callosity sharp and rugose.

Abdomen with strongly elevated chitinous ridge on sides of all segments, fifth segment with trace of groove above pygidium. Pygidium sparsely punctured with large punctures as on sides of abdomen. Genitalia as in figure 143.

SEXUAL DIMORPHISM: No female available for comparison; otherwise as in male of *alutacea*.

REMARKS: Perhaps this large species belongs in a group by itself because of its more foveate, less punctate elytra, virtual lack of costae, and greenish sheen (one specimen is fulvous), but the labrum is so nearly identical to that of both *alutacea* and *carinifrons* and the male genitalia of the three species are also so much alike, that I believe it can be left in this group. The genitalia, although much longer and wider, are shaped about as in the two named species (see fig. 143). The sinuate pronotal sides are present also in *alutacea*. The only other species of the group with the abdomen carinate is *jamaicensis*, which differs, among other characters, by having the pronotum coarsely and densely, not finely and sparsely, punctured. The only other species in the genus that are as large as *aereomicans* and have the abdomen carinate are *bowditchi* Fall and *puberea* Bates, both hairy species.

The type locality is the same as for two other Moser species (*fossifrons* and *puncticollis*); the latter is a hairy species, the former has the head impressed at the middle and the clypeus ridged at the sides.

***Diplotaxis jamaicensis* Cazier**

Figures 144, 145

Diplotaxis jamaicensis CAZIER, 1952, p. 3 (Ja-

maica, British West Indies; type, male, in British Museum).

DIAGNOSIS: Minutely hairy on elytra; head and pronotum virtually glabrous, abdomen ridged, forehead ridged or not. Distinguished from others of the group, except *aereomicans*, by having the abdomen ridged laterally; differs from *aeromicans* by having the abdominal ridge continuous across the eighth tergite above the pygidium, the punctures of the pronotum coarse and dense, not fine and sparse, the elytra with dorsal hairs.

RANGE: Endemic to Jamaica in the Greater Antilles. Twenty-two specimens examined. (See Appendix.)

HABITAT: The type and at least one of the paratypes were taken "in decaying matter of coconut," the only *Diplotaxis* reported from such a situation. However, as these beetles are known to hide under debris in the daytime, perhaps these individuals were merely waiting for nightfall.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 8 to 10 m. Head densely, sometimes confluent, punctured, surface either quite uniform (three of seven specimens) or rough and with an indistinctly formed transverse carina that is obsolete or interrupted at middle; clypeal suture either obliterated or distinct at sides only. Clypeus from one-third to one-half of length of head, the remaining characters as in *alutacea*, except that front margin is sometimes slightly emarginate instead of straight and sides are angulate in front of eye. Labrum from twice to two and one-half times longer than reflexed under side of clypeus, flat and level with the latter in front, slightly concave posteriorly, not strongly arcuate in front, punctures variable in size and density, occasionally with depression as in *alutacea*. Mentum with prominent declivity in about anterior half, posteriorly arcuate, pubescent, and strongly margined, sometimes sinuate.

Pronotum slightly longer than head and clypeus combined, sides somewhat impressed in front, punctures of same size as or larger than those on head and usually denser, sides strongly arcuate at about middle, thence gently rounded to front and hind angles which are not produced or impressed, often an impunctate area varying in length along

middle line; scutellum either densely punctured at base or punctured sparsely. Elytra more than three times longer than pronotum, with tiny hairs in all punctures, punctures dense, sometimes confluent, either smaller or larger than on pronotum, surface between punctures shining or alutaceous, second interval multipunctate, costae either convex and with sparser punctures or obscured by large punctures; subapical callosities normal.

Abdomen on sides with strongly elevated chitinous ridge extending through spiracles of fifth segment transversely across the eighth dorsal segment above the pygidium. Pygidium densely, rugosely punctured, surface very rough. Middle tarsi with first two segments about equal in length; hind tarsi about as long as hind tibiae; hind tibiae with setose carinae not conspicuous, extending only halfway across face. Genitalia as in figures 144 and 145.

SEXUAL DIMORPHISM: Male with first hind tarsal segment narrow and as long as the longer of the tibial spurs, female with it wider and definitely shorter than the spur, which is also wider than spur in male. No noticeable difference in length of fifth abdominal segment between the sexes.

REMARKS: This is a coarsely and densely punctured, stocky species, with the elytra sometimes shiny, sometimes opaque. When shiny, the elytra appear to have larger punctures, which may be caused by the reflections from the shining surface. The short inconspicuous hairs were mentioned in the original description; therefore this species is considered one of the dorsally hairy ones, although it is more than probable that the hairs would be overlooked except under high magnification. The hairs are present in all the punctures of the elytra, not just in those of the narrow intervals as is true of *alutacea*, but they are shorter than the few visible hairs in *alutacea*. A few minute hairs can be seen on the pronotum, head, and clypeus, but I call these parts in general virtually hairless, as they are also in *alutacea*.

It is possible that this species will be found to occur also on the mainland of Mexico or Central America, but so far it is known from Jamaica only. Only one other species has been recorded in the literature from the West Indies (*ebenina* Blanchard from Martinique),

but I have not seen this species and could not find the type in the museum in Paris. I have, however, seen a specimen of *atlantis* Fall in the Zoologisches Museum in Berlin, from the island of Guadeloupe, and it is possible that this is also Blanchard's species. A number of specimens of *jamaicensis* have been seen since the description in 1952: one collected by Bernard Heineman in 1957, five by Chester Roys from 1937, and others in the collection of the British Museum.

The paratype from Claremont and one from "Jamaica" lack the longitudinal space at the middle of the pronotum. The transverse carina on the head is usually weak and indistinct; it is nearly obsolete in four of the seven specimens at hand and is represented by a slight swelling behind the clypeus. The clypeus is not so angular in front as in *carinifrons*, but more as in *rita*; the labrum is very long, and in two individuals from Trelawny has a slight impression along the front margin as in the three preceding species. The carina on the sides of the abdomen is unusual because it does not stop at the spiracles, but continues across the eighth tergite just under the apex of the elytra. The antennal club appears to be proportionately shorter and thicker than in the other species of the group. The male genitalia (figs. 144, 145) are exceedingly narrow at the middle third of the lobes; in profile the lobes are very sinuous, unlike those of most species, and the apices are not deflexed. The internal sac, however, is about the same as in *carinifrons*. The claws seem very short and small in relation to the claw segment.

***Diploaxis metallescens* Bates**

Figures 77, 79, 148

Diploaxis metallescens BATES, 1888 (1887-1888), p. 164 (Tepanistlahuaca [Oaxaca], Mexico; type, female, in British Museum).

DIAGNOSIS: Glabrous, abdomen not ridged, forehead ridged. Perhaps most similar to *simplex*, differing from it and *fossifrons* by having the clypeal surface flat, not at all swollen, and the head without depression. Characterized by the dense regular punctures of both head and clypeus, these parts being separated by a shelf or frown that follows the angulation of the clypeal suture.

RANGE: Southern Mexico on the Pacific



FIG. 79. Distribution of *Diploaxis metallescens*.

coast. The only specimens seen are the type and another female from Tepanistlahuaca, Oaxaca; a male from La Concordia, Pochutla, April 23, same state; and a female from 7 miles south of Tumbiscatio, Michoacan, collected December, 1950, by Ray F. Smith. The last locality is between Apatzingan and the coast, and the two localities in Oaxaca are also not far from the coast. (See fig. 79.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 7.5 to 8.5 mm. Head densely punctured; clypeal suture bent backward at center in shallow V, distinctly impressed, sometimes causing frown on front of head. Clypeus as long as head, with same kind of punctures, front margin slightly emarginate or straight, scarcely at all reflexed, angles rounded, sides not sinuate. Labrum about three times longer than and level with reflexed under side of clypeus; faintly but densely punctured, flat in front, depressed behind, sides prominent, front margin arcuate. Mentum with declivity as in *alutacea*, but shorter, about in apical one-third or one-half.

Pronotum longer than head and clypeus combined, transverse, punctures of same size as on head but sparser, sides strongly arcuate, often angulate, just behind middle, thence obliquely to obtuse front and hind angles; base somewhat depressed transversely (may also be impressed). Scutellum densely punctured. Elytra about two and one-half times longer than pronotum, punctures uniform, larger, denser, deeper than on pronotum, second interval multipunctate, costae with row of slightly smaller punctures evenly

placed; marginal hairs short, sparse.

Abdomen not ridged laterally, but sharply keeled in one specimen, fifth segment with groove above pygidium. Pygidium densely punctured. Genitalia as in figure 148.

SEXUAL DIMORPHISM: As in *alutacea*.

REMARKS: This small species has the labrum definitely long, but without the depressions or elevations present in *alutacea*. The pronotal sides are strongly arcuate-angulate as in *carinifrons*. The lateral lobes of the male genitalia (fig. 148) are longer, more attenuate, than in the other species, and slightly sinuate. The species is reminiscent of *harperi* Blanchard from the United States in the labrum, head, and clypeus, but the pronotum differs. The clypeal suture is bent back as in *fossifrons* and *simplex* (fig. 77).

***Diplotaxis fossifrons* Moser**

Figures 80, 146, 147

Diplotaxis fossifrons MOSER, 1918, p. 314 (Necaxa [Puebla], Mexico; type, female, in Zoologisches Museum, Berlin).

DIAGNOSIS: Glabrous, abdomen not ridged, forehead not ridged. This is the only large, dark, and glabrous species with the front of the head triangularly impressed at middle except *knausii*, which has the labrum bilobed, not nearly flat, and occurs much farther north. Head rather similar to the small (7 or 8 mm.) *simplex* (which follows), but that species has the clypeus usually swollen at middle base, not at sides, and the front margin nearly straight, not sinuate.

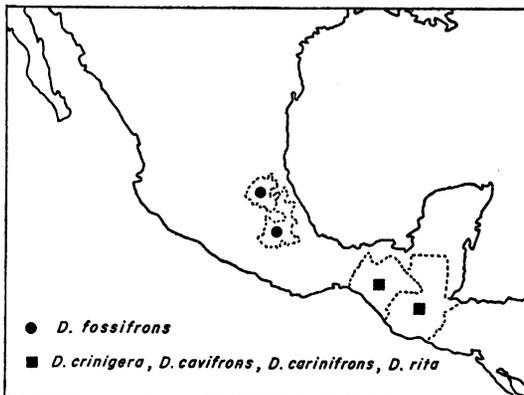


FIG. 80. Distribution of *Diplotaxis carinifrons*, *fossifrons*, *rita*, *cavifrons*, and *criniger*.

RANGE: States of Puebla and Hidalgo in east central Mexico. The type locality is at about 3200 feet. Six specimens have been examined: the type, a female, from Necaxa, Puebla; one male from Jacala, Hidalgo, July, 1951, and three males and one female from 6 miles north of Jacala, 6000 feet, June, 1955. (See fig. 80.)

HABITAT: Four of the specimens were collected by P. and C. Vaurie at night from low vegetation near a mountain road above Jacala. There were two species of *Rhus* along the path where the beetles were taken. Small series of three dorsally hairy species (*puncticollis*, *hirsuta*, and *jacala*) were picked from the same vegetation, and a large series of over one hundred specimens of an undescribed species.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 9.5 to 10.5 mm. Head triangularly impressed at middle behind clypeal suture which is bent backward angularly, sparsely punctured. Clypeus one-half of length of head, punctured as on head or sometimes more densely, at sides with a short transverse ridge in front of eyes, but sometimes obsolete, ridge usually lacking at middle; margins broadly reflexed, front margin sinuate, side margins straight, angles broadly rounded. Labrum gently concave, flat only at front edge, which is level with under side of clypeus and but slightly curved, labrum more than twice as long as reflexed under side of clypeus, finely punctured. Mentum slightly declivous in anterior half or more, declivity arcuate, not or scarcely margined, and sparsely pubescent posteriorly.

Pronotum not much longer than head and clypeus combined, finely, sparsely punctured as on head, sides gently rounded, angles not produced or impressed; scutellum usually covered with dense punctures. Elytra with punctures twice as large as those on pronotum, denser, often confluent, second interval multipunctate, costae convex and with smaller punctures. Metasternum at middle convex anteriorly, triangularly depressed posteriorly.

Abdomen not ridged laterally, second segment without tubercles but may have indistinct paired swellings, fifth segment without groove above pygidium. Pygidium ir-

regularly, partly confluent punctured, the punctures larger than those on sides of abdomen. Genitalia as in figures 146 and 147.

SEXUAL DIMORPHISM: Male with first hind tarsal segment as long as tibial spur; female with it shorter than spur. Female with long spur of hind tibiae scarcely thicker than spur of male.

REMARKS: The asymmetrical male genitalia of this species are quite unique (figs. 146, 147), not only in the shape of the apices of the lobes, but in the manner in which these dovetail, the apex of one lobe being hollowed below and covering that of the other which is broadly grooved to receive it. They are also of very large size. In *simplex* the apices are acute, symmetrical, and scarcely overlap; in *cribriceps* (*trapezifera* group) and *ohausi* (*ohausi* group), the apices overlap a little, but the shape is different from that in both *fossifrons* and *simplex*. The genitalia of *fossifrons* are so unusual that one would expect the external appearance also to be out of the ordinary, but this is not the case. Superficially this species resembles *rita* from Chiapas, which is also large, black, and shiny and has a short transverse pronotum, but that species has an interrupted ridge behind, not on, the clypeus, and the pronotum has more abruptly rounded sides and sparser punctures. These lateral clypeal ridges of *fossifrons* are similar to those of *vandykei* from Alabama, a dorsally hairy species, but are less marked. The labrum is almost as long as it is in *alutacea*, *carinifrons*, *aereomicans*, and *metallescens*, but it is more hollowed, less flat, than in those species. Moser found his species close to the smaller *simplex* "in the carinate clypeus and excavated forehead." He described two other species from the same type locality (Necaxa), *aereomicans* and *puncticollis*, the latter a hairy species.

***Diplotaxis simplex* Blanchard**

Figures 81, 82, 149

Diplotaxis [*sic*] *simplex* BLANCHARD, 1850, p. 172 ("Vera-Cruz," Mexico; type not found in Muséum d'Histoire Naturelle, Paris).

Diplotaxis sinuaticeps BATES, 1888 (1887-1888), p. 162 (type locality not designated, but type, female, is from Veracruz, Mexico, in British Museum). New synonymy.

Diplotaxis cephalotes FALL, 1909, p. 67 ("southern Illinois"; type, male, in Museum of Comparative Zoölogy). New synonymy.

DIAGNOSIS: Glabrous, abdomen not ridged, forehead not ridged. The combination in this small (7 to 8 mm.) species of the swelling at the middle of the clypeus and a triangular impression behind it (fig. 82) on the head serve, when distinct, to distinguish *simplex* from most other small species except *parvula* which differs by having hairs on the clypeus and the pronotal sides very angulate. A sharp little longitudinal keel on the second abdominal segment at the middle has not been noticed in any other species of the genus, but it is not invariably present. Pronotum longer, less transverse than in others of the group.

RANGE: Eastern Mexico from the coast of southern Tamaulipas and from southeastern San Luis Potosi south in Veracruz to Chiapas and Yucatan; at high and low altitudes. Approximately 800 specimens have been examined. (See Appendix for locality data; see fig. 81.)

HABITAT: About 700 individuals were secured on successive nights by P. and C. Vaurie in July, 1955. They were picked from the weeds and low vegetation on the hillsides and shores of the volcanic Lake Catemaco in southern Veracruz, where there were many plants of the family Rubiaceae. At the same time only 68 individuals of other species were found (*poropyge*, *microtichia*, and unidentified species of the *trapezifera* group). Some *simplex* were found at night feeding on the flowers and leaves of gardenia bushes surrounding some cabins by the lake;

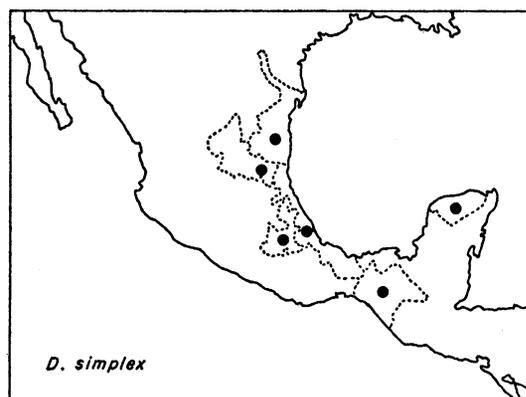


FIG. 81. Distribution of *Diplotaxis simplex*.

two other specimens were found in the daytime. At Papantla farther north along the coast a small series of 13 were collected in the same manner at night in a weedy field in which predominated the weed called *pata de vaca* (*Bauhinia mexicana*); here another species, *subrugata* Moser, was in abundance; we took about 350 individuals. At Jalapa five specimens were found at night on roadside weeds during a mist-like drizzle.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 7 to 8 mm. Head shallowly or strongly triangularly impressed at middle behind clypeal suture which is bent backward angularly (not always markedly so), surface finely punctured, punctures separated by about their own widths. Clypeus about one-half of the length of head, sometimes longer, trapezoidal, slightly or strongly transversely swollen at middle base, surface punctured more densely than head, often rugosely, margins but narrowly reflexed, side margins shallowly sinuate, front margin truncate or slightly sinuate, angles broadly rounded, sometimes angulate. Labrum flat, the front edge level with under side of clypeus, finely, sometimes densely, but always faintly punctate, definitely longer than, sometimes twice as long as, reflexed under side of clypeus. Mentum declivous in anterior half, declivity arcuate, margined, and pubescent posteriorly, appearing smooth and shiny as labrum.

Pronotum one-third or more longer than head and clypeus combined, lateral margins evenly rounded from behind middle to front and hind angles, finely, densely or sparsely punctate with punctures of same size as those on head; scutellum usually covered with dense punctures. Elytra irregularly punctured with larger punctures than those on pronotum, second interval multipunctate, sometimes vaguely unipunctate, costae convex, with minute punctures. Metasternum at middle convex anteriorly, triangularly depressed posteriorly.

Abdomen not ridged laterally, second segment at middle either with small round swelling or with sharp carina or tubercle (sometimes lacking), fifth segment without groove above pygidium. Pygidium densely, regularly punctate. Genitalia as in figure 149.

SEXUAL DIMORPHISM: Male with first hind tarsal segment as long as tibial spur; female with it shorter.

REMARKS: A few non-typical individuals of this species (clypeus scarcely swollen, head scarcely impressed) have been taken in Tamaulipas and San Luis Potosi, although the great concentration of the species is farther south, in Veracruz. A species of similar size and same general appearance common in Tamaulipas is *curvaticeps* Fall which, however, has no clypeal ridge and no impression on the head, has the clypeus rounded from side to side, not so truncate, the pygidium sparsely punctured, and different male genitalia.

The unusual projection in the middle of the second abdominal segment in most specimens may be in the form of a sharp little keel about one-third or less of the length of the segment, or in the form of a tubercle, or merely a slight swelling. It is not a sexual character nor does it vary geographically. A series of six individuals from Tamazunchale, San Luis Potosi, have no tubercles, but an individual from La Pesca in Tamaulipas has the tubercle. Series from various places in Veracruz may or may not have it. The tumidity on the clypeus and the depression on the head vary also in size and intensity; most of the specimens seen from Jalapa and Orizaba have both more pronounced, whereas other populations from Veracruz have them generally less noticeable. The clypeal suture is almost always at least slightly sinuate at the middle, but if it is not, and if the head impression is also not present, as is true in some specimens from Tamazunchale, then, in order to identify *simplex*, one must look carefully for a slight swelling just in front of the suture at the middle.

The type of Bates's *sinuaticeps* (Veracruz) has the clypeal suture impressed and sinuate and the head impressed behind, but no tumidity on the clypeus. As shown above, the tumidity is not always evident, and I cannot separate the large amount of material at hand into two forms on the basis of the variable clypeus or other characters (the sixth segment of the abdomen is exerted in many specimens, as stated by Bates in *sinuaticeps*); therefore I consider this form

synonymous with *simplex*. From the same locality (Jalapa) I have seen specimens with the clypeus tumid or not. The specimens from Playa Vicente, Mexico, and from La Tinta, Verapaz, Guatemala, included by Bates for "*sinuaticeps*" (1887-1888, p. 162; 1889, p. 397) have been examined at the British Museum, and they are not this species.

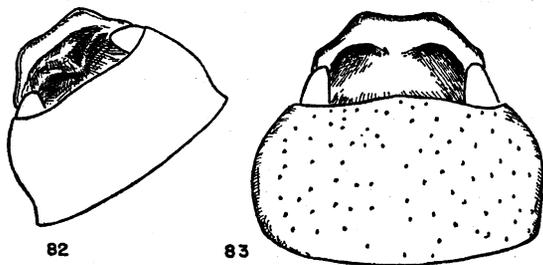
Fall's *cephalotes* is also a synonym; it was based on a specimen from the Bowditch collection labeled "southern Illinois." This locality, as is the "Missouri" of the Mexican species *bowditchi*, is evidently an error. The type no longer has its head or pronotum, but the abdomen agrees with that of specimens of *simplex* compared with it, and the description by Fall of the "tumid clypeus and strongly triangular front impression" leaves no doubt as to its identity. It has never been taken in the United States. There is another species in Arizona and Mexico with the clypeus often tumid (*abnormis*), but it has only nine segments in the antennae instead of 10 and excavated areas on the pronotum.

The male genitalia (fig. 149) have the apices of the lateral lobes with their acute tips turned inward and very slightly overlapping, the "pincer" type of genitalia often characteristic of forms of the *trapezifera* complex.

***Diplotaxis rita* Vaurie, new species**

Figures 60, 80, 83, 150

TYPE MATERIAL: Type, male, Santa Rita, 5 miles north of San Fernando, Chiapas, Mexico, 3000 feet, October, 1953, at light, Robert K. Selander, collector, and three female paratypes, same data, in the Ameri-



FIGS. 82, 83. The *simplex* group of *Diplotaxis*. 82. *D. simplex*, showing tumidity of clypeus and depression on head. 83. *D. rita*, showing sparse pronotal punctation and interrupted carina on head.

can Museum of Natural History. Also, one male paratype from Capetillo, Sacatepequez, Guatemala, is in the British Museum (Natural History), and one male paratype from Coban, Alta Verapaz, Guatemala, November, is in the United States National Museum.

DIAGNOSIS: Glabrous, abdomen not ridged, forehead ridged. A large, black, polished species, with pronotum the same shape as that of *fossifrons* Moser (Puebla), but even more sparsely punctured. The clypeus is also rather similar in shape, but the front of the head is ridged laterally and coarsely punctured in *rita*, not at all ridged, and finely punctured, in *fossifrons*. Fifth abdominal segment markedly swollen on each side of pygidium and coarsely punctured.

RANGE: State of Chiapas in extreme southern Mexico, and Guatemala (see fig. 80).

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here). Length, 10.5 mm. Head with large punctures, dense in front, and a punctate transverse ridge behind clypeus, the ridge interrupted and obsolete at middle; clypeal suture visible at sides only. Clypeus one-half of length of head, punctures denser than those on head, front margin shallowly reflexed, slightly sinuate between broadly rounded angles, side margins nearly straight. Labrum about twice as long as and level with the reflexed under side of clypeus, flat in front, slightly concave behind, finely, densely punctate, front margin arcuate. Mentum with declivity in anterior half posteriorly margined, arcuate, and pubescent.

Pronotum a little longer than head and clypeus combined, very sparsely, irregularly punctured, there being large impunctate areas, sides arcuate at middle, thence evenly rounded to right-angled front angles and obtuse hind angles, sides at middle with small dimple present in many *Diplotaxis*; scutellum with about 15 punctures. Elytra about three times longer than pronotum, punctures larger than on pronotum and denser, second interval multipunctate; costae convex and with smaller, sparser punctures.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium irregularly sparsely punctured. Genitalia as in figure 150.

SEXUAL DIMORPHISM: Male with first hind

tarsal segment as long as the longer of the tibial spurs, female with it shorter. Female with hind tibial spurs very wide, twice as wide as in male and as wide as base of first tarsal segment (fig. 60). Hind tarsi shorter in female, but fifth abdominal segment longer.

REMARKS: No other species I know (except perhaps *transversicollis* Moser, with different labrum) has the pronotum so sparsely punctured (fig. 83). This character is especially marked in the three paratypes from Santa Rita which have some impunctate areas as large in extent as the scutellum, and in the paratype from Coban which has the head also very sparsely punctured. The females have exceedingly broad, rather stubby spurs on the hind tibiae and short hind tarsi, as in some females of the *puberula* group of dorsally hairy species (see fig. 60). Males also have short tarsi, those on the hind legs being shorter than the hind tibiae.

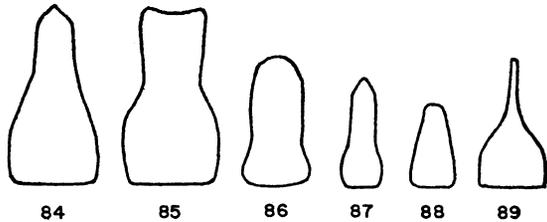
Although rather similar to *fossifrons* as stated in the diagnosis, *rita* differs in a number of characters, especially in the male genitalia (fig. 150) which are not distinctive in *rita*, but are quite unique in *fossifrons*. In *rita* the lobes of the genitalia are somewhat constricted before the apex, and the apices are slightly curled down and under. The interrupted carina on the head behind the clypeus is not so definite as it is in *carinifrons*, but more as in *jamaicensis*; it is virtually obsolete on the paratype from Coban. The labrum, although long, does not appear so long or so large as in the other species.

The paratype from Capetillo is a specimen recorded by Bates (1889, p. 399) under number 25 (A) as "a single example of a doubtful species."

At the time of the writing of the "Biologia Centrali-Americana" only two or three species were recorded from Chiapas, but there are now at least 14. Two other species of this group occur in the same area as *rita*: *carinifrons* from Simojovel and *simplex* from Ocosingo Valley. These localities are in the northern part of the state, north of San Cristobal de las Casas, but Santa Rita, near San Fernando, is west of Tuxtla Gutierrez, more in the central part.

SPECIES GROUP *hebes*

The following species are included in this



FIGS. 84-89. Eighth sternite outlines of some *Diplotaxis*. 84. *D. illustris*. 85. *D. fossipalpa*. 86. *D. pilifera*. 87. *D. hallei*. 88. *D. carinata*. 89. *D. ohausi*.

group: *Diplotaxis hebes* Bates; *mima* Vaurie and Cazier; *cribratella* Bates; *carinata*, new species; *abnormis* Fall; and *contracta* Bates.

This is a clear-cut group composed of six small (6 to 8 mm.), non-hairy species that have nine instead of 10 segments in the antennae. The males (I have seen only females of *contracta*) have the abdomen sericeous or with a "silky shimmer" (Moser, 1918, p. 308) that is characteristic. These species have the front angles of the pronotum acute and produced; they also have the head or base of the pronotum or the pronotal hind angles, or the base of the elytra, or a combination of any of these parts, often eroded, impressed, or pruinose and opaque. The lateral lobes of the male genitalia, as well as the internal sac of those species dissected, are all of the same general type.

DIAGNOSTIC DESCRIPTION: (The following characters are not repeated in the descriptions of the species). Dorsal surface without hairs. Clypeus without hairs, its margins scarcely reflexed, front angles rounded. Eyes small, about one-sixth or one-fifth of width of head. Antennae nine-segmented, club about as long as funicular segments. Maxillary palpi without dorsal impressed area. Mandibles large, strong. Elytra with second interval multipunctate, base between humeral umbone and scutellum impressed, often opaque or pruinose, marginal hairs short, sparse, often scarcely visible. Abdomen with transverse impression on fifth segment above pygidium. Front tibiae tridentate, basal tooth situated in front of middle. Middle tarsi with first two segments about equal in length, hind tarsi with second segment longer than first. Pygidium densely, rugosely punctured with large punctures.

SEXUAL DIMORPHISM: Males with abdomen alutaceous or sericeous, the surface covered

with tiny granules that give a silky effect; females with abdomen shining. Males with first tarsal segment of hind tarsi a little longer than in female, also hind tarsi longer, but not longer than hind tibiae. Both sexes have the hind tibial spurs equally narrow. Pygidium is more transverse in male and strongly retracted or bent under.

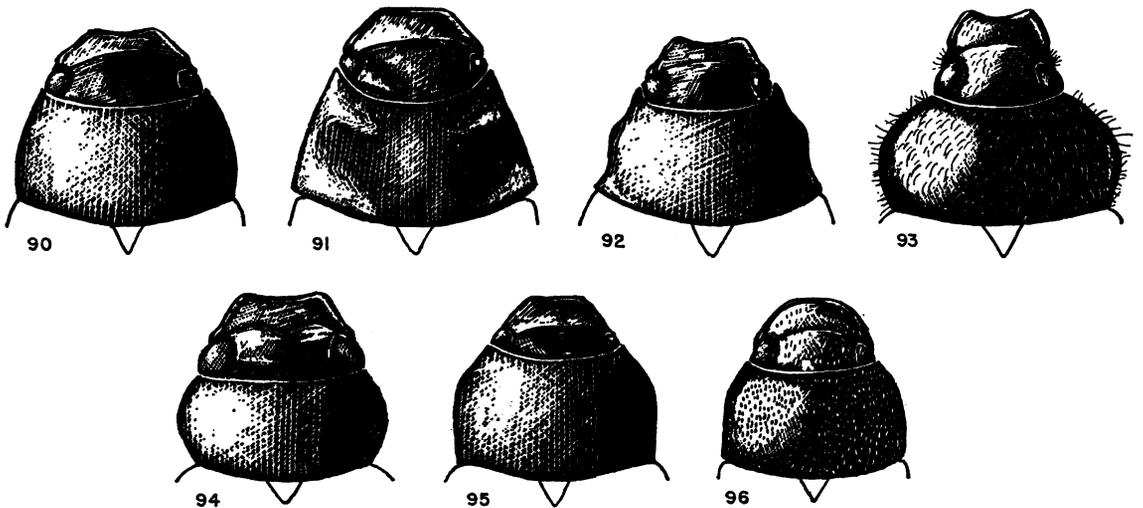
KEY TO THE SPECIES OF THE *hebes* GROUP

1. Ventral segments ridged laterally along elytral margin (fig. 98) 2
 Ventral segments rounded laterally, not ridged 3
2. Pronotal sides not emarginate at base; tarsal claws evenly rounded, toothed near middle (fig. 5) *mima*
 Pronotal sides strongly emarginate at base (fig. 92); tarsal claws bent abruptly at middle, almost at right angles, toothed near apex (fig. 7) *contracta*
3. Tarsal claws bent abruptly at middle, almost at right angles, toothed near apex, inner tooth as long as claw (fig. 7) *cribratella*
 Tarsal claws evenly rounded, toothed near middle, inner tooth much shorter than claw (fig. 5) 4
4. Pronotum widest at middle, hind angles usually not extending laterally any farther than front angles (fig. 90); head never with opaque, eroded areas *hebes*
 Pronotum widest at base where hind angles either extend laterally well beyond base of elytra, or at least are somewhat flared out-

- ward or upward (fig. 91); head often with opaque, eroded areas 5
5. Pronotum without median carina; pronotum and head with sparse punctures; United States and northern Mexico . . . *abnormis*
 Pronotum with short median carina in front reaching to near base as an impunctate line; pronotum and head with dense, touching punctures; central Mexico *carinata*

DISCUSSION: The only species of the group taken as far north as the United States is *abnormis*; the others occur from northern Mexico south to the states of Jalisco, Michoacan, Guerrero, and Mexico in central Mexico, *mima* and *contracta* being known at present from Durango only and *carinata* from Jalisco only.

The principal differences among the members of the group lie in the conformation of the tarsal claws, the labrum, whether the abdomen has a ridge laterally or not, and the shape of the clypeus (see table 5). The mentum presents some small differences as between *hebes* and *mima* and the other species, but the mentum is very difficult to diagnose, not only because the beetles are so small, but also because the differences are slight and readily obscured by wear or debris. None of the species has a sharp mental declivity with truly distinct raised margin at the base as in some *Diplotaxis*, the declivity when present being very short and indistinct.



FIGS. 90-96. Head and pronotum of some *Diplotaxis*. 90. *D. hebes*. 91. *D. abnormis*. 92. *D. contracta*. 93. *D. coriacea*. 94. *D. carinifrons*. 95. *D. rockefelleri*. 96. *D. mus*. (All specimens were tipped slightly backward.)

Other species with nine-segmented antennae are *saylori* Cazier from the mountains of southern Arizona, a robust flightless species that is quite different from the present species, and *rudis* LeConte, a hairy species with non-cleft claws from central and northwestern United States.

Most of the specimens of this group that have been examined belong to two species (*hebes* and *cribratella*), which account for 770 of the 880 specimens seen. The types of all the forms have been studied.

Diplotaxis hebes Bates

Figures 90, 97

Diplotaxis hebes BATES, 1888 (1887-1888), p. 164 (type locality not designated, but type is from Ciudad, Mexico [=Ciudad Durango, Durango]; type, female, in British Museum).

Diplotaxis sericeiventris MOSER, 1918, p. 308 (Mexico; type, male, in Zoologisches Museum, Berlin). New synonymy.

DIAGNOSIS: Abdomen not ridged, claws median. Most similar to *mima*, with the same labrum, mentum, and claws, but differs from it by lacking the abdominal ridge. The rather flat or convex labrum, the medially toothed, not angulate claws, and emarginate rather than truncate clypeus separate it from *cribratella*.

RANGE: The highlands of northwestern Mexico south to Mexico State. A total of 223 specimens has been examined from the states of Chihuahua, Durango, Michoacan, and Mexico. (See Appendix; also fig. 97.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 7 to 8 mm. Head with front descending steeply to clypeus, sometimes with median depression behind clypeus, surface densely or sparsely punctate. Clypeus about one-fourth of length of head, very broad, more densely punctured than head, front margin emarginate, lateral margins nearly straight. Labrum flat or slightly convex, shallowly curved in front, sparsely, if at all, punctured, only slightly longer medially than reflexed under side of clypeus. Mentum with declivity concave, not margined posteriorly, poorly defined.

Pronotum widest at middle, sides slightly sinuate and constricted to acute anterior angles, which, as well as hind angles, are im-

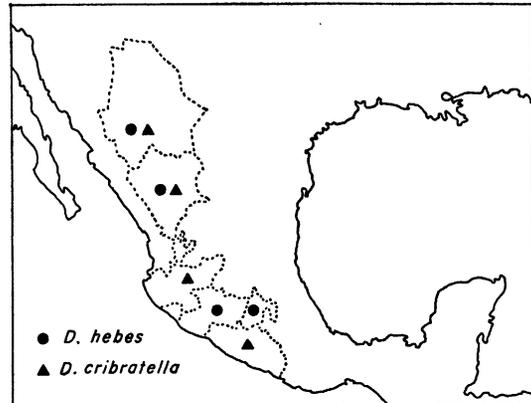


FIG. 97. Distribution of *Diplotaxis hebes* and *D. cribratella*.

pressed, sometimes opaque within, surface of disc with sparse or very sparse and irregular punctures, base often eroded, opaque; scutellum sparsely or densely punctate. Elytra with larger punctures than pronotum, costae convex, distinct, with smaller punctures. Abdomen not ridged laterally. Claws evenly, shallowly rounded, cleft medially, tooth shorter than claw (fig. 5).

SEXUAL DIMORPHISM: As given for group.

REMARKS: Although so much like *mima*, this species is also very similar to *cribratella*, with which it was taken in a number of the same localities in Mexico: Palos Colorados, El Salto, Otinapa, and Coyotes in Durango, and Santa Barbara in Chihuahua. Bates himself identified a specimen of *cribratella* as *hebes*; this is the specimen, which I have examined, from Santa Clara in Chihuahua, that he added in his supplement (1889, p. 399). The claws, clypeus, and labrum, however, will serve to distinguish the two species (see table 5). The male genitalia are about as in figure 151 showing those of *abnormis*, but the lobes are not so bulbous apically in *hebes*. The opaque or pruinose dorsal areas are distributed pretty much at random, as is also true in *cribratella*, *mima*, and *abnormis*. In *hebes*, of 223 individuals, 45 (including the type) are shining and have no pruinosity, 88 have the base of the elytra only pruinose, 33 the base of the pronotum only, and 62 are opaque at the base of both pronotum and elytra. In color *hebes* is mostly dark red or piceous, as are *mima* and *carinata*, whereas of *cribratella*

TABLE 5
SOME SPECIFIC DIFFERENCES AMONG SPECIES OF THE *hebes* GROUP OF *Diplotaxis*

Species	Claws	Abdomen	Clypeus ^a	Labrum	Mentum
<i>hebes</i>	Median	Not ridged	Emarginate	Flat to convex	Declivity concave, no margin, no hairs
<i>mima</i>	Median	Ridged	Emarginate	Flat to convex	Declivity concave, no margin, no hairs
<i>cribratella</i>	Subapical	Not ridged	Truncate	Shallowly impressed throughout	Declivity indistinct, slight margin, hairs
<i>carinata</i>	Median	Not ridged	Truncate	Suddenly, slightly impressed middle	Declivity indistinct, no margin, but hairs
<i>abnormis</i>	Median	Not ridged	Truncate	Shallowly impressed throughout	Declivity indistinct, no margin, but hairs
<i>contracta</i>	Subapical	Ridged	Emarginate	Shallowly impressed throughout	No declivity evident

^a Clypeus is somewhat variable.

there are perhaps more light tan than dark individuals.

The type of Moser's *sericeiventris*, a male, has been compared with specimens of *hebes* and was found to belong to the same species.

***Diplotaxis mima* Vaurie and Cazier**

Figure 98

Diplotaxis mima VAURIE AND CAZIER, 1955, p. 8, figs. 1, 3A (Palos Colorados, Durango, Mexico; type, male, in the American Museum of Natural History).

DIAGNOSIS: Abdomen ridged, claws median. Similar to *hebes* in most characters but differing in the presence of the chitinous ridge on the abdomen; it is also generally more densely, deeply punctate, especially on the pronotum. Differs from all others in the group except *contracta* in the ridged abdomen, and from the latter by having a median, not subapical, tooth on the claws.

RANGE: Known only from the state of Durango in northwestern Mexico. Only 67 specimens, including the type, have been seen, three of them from Otinapa, 8200 feet, August, 1947, and 64 from Palos Colorados, 8000 feet, August, 1947.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 7 to 8 mm. Head as in *hebes* but densely punctate. Clypeus, labrum, mentum as in *hebes*. Pronotum widest just behind middle, sides scarcely arcuate, obliquely constricted to acute anterior angles which are

strongly produced, front and hind angles impressed within, often opaque, surface irregularly and sparsely or densely punctate, base often eroded, opaque. Scutellum and elytra as in *hebes*. Abdomen ridged laterally with strong longitudinal carina, segments sometimes tumid. Claws as in *hebes*.

SEXUAL DIMORPHISM: As given for group.

REMARKS: The elongate elytral punctures outlined with white mentioned in the description of *mima* as characteristic of the species actually occur also in *hebes* and *carinata*. The dorsal pruinosity or lack of it varies in this species, as it does in the others of the group. Some individuals have the abdominal segments tumid, but not so strongly so as *carinata*. The male genitalia are essentially as in *carinata* (fig. 152), but are not so elongate.

***Diplotaxis cribratella* Bates**

Figure 97

Diplotaxis cribratella BATES, 1889, p. 399 (Omiteme, Guerrero, Mexico; type, female, in British Museum).

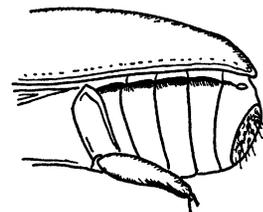


FIG. 98. Ridged abdomen illustrated by *D. mima*, showing posterior spiracle.

Diplotaxis ennea VAURIE AND CAZIER, 1955, p. 7, figs. 1, 3C (Catarinas, Chihuahua, Mexico; type, male, in the American Museum of Natural History). New synonymy.

DIAGNOSIS: Abdomen not ridged, claws subapical. The abruptly angulate tarsal claws which are toothed near the apex distinguish this species from others of the group except *contracta*, which differs by having a chitinous ridge on the sides of the abdomen.

RANGE: Chihuahua and Durango in northwestern Mexico south to Jalisco and the highlands of Guerrero. Material examined includes 549 specimens. (See Appendix for locality data; see fig. 97.)

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 6 to 8 mm. Head as in *hebes*, but densely punctate. Clypeus about one-fourth of length of head, very broad, densely punctate, front margin slightly emarginate or truncate, lateral margins nearly straight. Labrum slightly concave, sunken, sparsely or densely punctate, twice longer at middle than reflexed under side of clypeus. Mentum rather flat, the declivity at anterior third indistinct, with base arcuate, slightly irregularly raised, and pubescent.

Pronotum widest at middle, sides slightly sinuate and constricted to acute anterior angles which are strongly produced, front and hind angles with impressed, sometimes opaque, areas within, surface of disc with sparser punctures than on head, base often eroded, opaque. Scutellum, elytra, and abdomen as in *hebes*. Claws abruptly angulate medially, cleft subapically, tooth almost as long as claw and close to it.

SEXUAL DIMORPHISM: As given for group.

REMARKS: According to the material examined, this is a very abundant beetle, especially in Catarinas in southern Chihuahua, where 250 specimens were collected in 1947 (the type and paratypes of "*ennea*"). The type, however, is from much farther south, from Omilteme, Guerrero, at 8000 feet. This locality does not appear on modern maps, but is shown in Godman (1915, map 5) as just west of Chilpancingo.

The surface of the head varies from being smooth to being irregular, and one individual has two eroded spots near the eyes, somewhat as in *carinata*. The clypeus, although

usually truncate, is sometimes shallowly emarginate in front. The pruinosity is absent in 130 of 548 individuals (including the type); 268 have only the base of the elytra, 98 only the base of the pronotum, and 52 the bases of both elytra and pronotum, pruinose. The male genitalia are similar to those of *hebes*, less bulbous than those of *abnormis* (fig. 151).

The description of *ennea* was made before the type of *cribratella* had been seen; *ennea* is a pure synonym. Although Bates likened his *cribratella* to *hebes*, he made no mention of either the nine-segmented antennae or the subapically cleft claws, and these omissions, plus the southern locality of *cribratella*, evidently misled Vaurie and Cazier to consider *ennea* a new species.

***Diplotaxis carinata* Vaurie, new species**

Figures 88, 152

TYPE MATERIAL: Type, male, 15 kilometers south of Mazamitla, Jalisco, Mexico, 5500 feet, July 29, 1952, F. W. and F. G. Werner, collectors, in collection of the University of Arizona. There are eight female paratypes, same data, four of which are in the University of Arizona, three in the American Museum of Natural History, and one is in the collection of Henry Howden.

DIAGNOSIS: Abdomen not ridged, claws median. Differs from others of the group by having a short median carina in apical half of the pronotum, which divides the deep transverse depressions on each side. Otherwise it seems very closely related to *abnormis* which, however, is less densely punctured dorsally, does not have the abdominal segments swollen, and has differently shaped male genitalia.

RANGE: State of Jalisco in west central Mexico. Mazamitla is on the border between Jalisco and Michoacan, south of Lake Chapala, in an area of open oak and pine forests.

DESCRIPTION OF TYPE, MALE: (See diagnostic description of group for characters omitted here.) Length, 7.5 mm. Head descending obliquely to clypeus, with a semi-circular depression behind clypeus containing a few oblong punctures, rest of head with dense, touching, round punctures, head at rear with a small round depression medially, behind which are two oblong eroded areas extending along front edge of pronotum al-

most to eyes. Clypeus about one-third of length of head, not quite so densely punctured as head, front margin truncate, with rounded angles, the whole giving effect of being broadly rounded from side to side. Labrum slightly but abruptly impressed along median line, impunctate, at least twice longer at middle than reflexed under side of clypeus. Mentum with short, indistinct declivity in about anterior fifth, declivity rather concave, its basal margin rounded off (no raised edge) and pubescent.

Pronotum widest at basal angles which flare slightly upward and outward and extend laterally beyond sides of elytra; sides scarcely arcuate behind middle, narrowed to acute and forward-produced front angles, all angles impressed within, surface densely punctate except for impunctate center space that becomes carinate in apical third of pronotum, apical third deeply transversely depressed each side of carina, base more or less eroded, opaque; scutellum covered with large punctures, some confluent. Elytra with punctures of same size as those of pronotum, but elongate, very dense; costae convex but indistinct, very narrow, with smaller punctures that, however, take up most of width of costae, base between humerus and scutellum shining.

Abdomen as in *hebes*, but three middle segments transversely swollen, tumid. Claws as in *hebes*. Genitalia as in figure 152.

SEXUAL DIMORPHISM: As given for group.

REMARKS: The paratype series is quite uniform in size (7.5 to 8 mm.) and in other characters. The pronotal carina and depressions are present in all individuals, and the depressed or uneven areas of pronotum and head are encrusted with mud (the type was soaked clean). The eroded head resembles that of *abnormis*, and the shape of the pronotum is nearly as in that species (fig. 91), but the front angles in *carinata* are not so narrow and pointed. The front margin of the clypeus is more rounded at the angles than shown in figure 91 of *abnormis*. All the paratypes have segments 2 to 5 of the abdomen swollen, in some of the females very markedly so, and in this character they differ from *abnormis*. The narrow costae of the elytra become wider towards the apex. The genitalia of the only male examined (the type) are

similar to those of *hebes* and the others except that they are longer, narrower, and have the apices of the lobes slightly different (fig. 152).

The tumidity of the abdominal segments mentioned above is not necessarily a valid character; it may or may not be constant within a species. In *mima* about a dozen of the 69 specimens examined have the abdominal segments tumid, in *hebes* some specimens show a tendency in this direction, and in *contracta* the two females examined have them strongly tumid.

Diplotaxis abnormis Fall

Figures 91, 151

Diplotaxis abnormis FALL, 1909, p. 78, pl. 1 (New Mexico; type, female, in Museum of Comparative Zoölogy).

DIAGNOSIS: Abdomen not ridged, claws median. This species and *contracta* are the only ones in the group with distinct eroded impressions on the head, but these erosions are not invariably present. Probably most similar to *carinata* which has some slight erosion on the head, but *abnormis* lacks the median carina in the apical half of the pronotum, and has a more sparsely punctured pronotum, with more acuminate front angles.

RANGE: New Mexico and the mountains of southern Arizona in the United States, and northern Sonora and Chihuahua, Mexico. A total of 35 specimens has been examined. (See Appendix for locality data.)

HABITAT: Individuals were collected at light in the Patagonia Mountains (mesquite-chaparral association), Madera Canyon (oak, pine, and juniper), and Garden Canyon (sycamore, maple, and juniper), all in Arizona.

DESCRIPTION: (See diagnostic description of group for characters omitted here). Length, 6 to 8 mm. Head either as in *hebes*, or, more often, with an oblong, eroded, opaque area above each eye and in front a depressed triangular area, also sometimes frontal erosions and a median carina, head rather sparsely punctured where not eroded. Clypeus about one-half of length of head, densely punctured, base slightly swollen transversely, front margin truncate or scarcely emarginate, lateral margins slightly sinuate. Labrum shallowly concave, sunken through-

out, sparsely punctured, longer medially than reflexed under side of clypeus. Mentum rather convex, declivity very short, often not recognizable, its basal edge rounded off without raised margin, pubescent.

Pronotum widest at base where hind angles flare upward and outward, sides slightly arcuate near middle, then narrowed to acute and forward-produced front angles, disc usually sparsely punctured; base, also hind and/or front angles, often narrowly or broadly depressed, eroded, and opaque (in one specimen the entire apical half of pronotum is eroded); scutellum sparsely punctured. Elytra, abdomen, and claws as in *hebes*. Genitalia as in figure 151.

SEXUAL DIMORPHISM: As given for group.

REMARKS: At the time of Fall's revision (1909) this was the only species said to have nine instead of 10 segments in the antennae. Actually three of Bates's species (*hebes*, *cribratella*, and *contracta*) had nine, but he did not say so. At the present time not only the six members of this group having nine segments but also *rudis* LeConte (1859), which was previously in the genus *Diazus*, and *saylori* Cazier (1940a), are known.

Diplotaxis abnormis is not nearly so common as *mima*, *cribratella*, or *hebes*, and it is the only one of the group that has been taken in the United States. I had seen only a few specimens before W. J. and J. W. Gertsch in 1949 collected a series of eight males and eight females in Garden Canyon, Huachuca Mountains, southern Arizona. I have now seen also six specimens from northern Sonora at the British Museum; these are the ones Bates mentions (1887-1888, p. 165) as "*Diplotaxis*—?," saying that they had probably been described by American entomologists.

Some of the erosion on the head and pronotum is quite fantastic, the surface sometimes being markedly scooped out and opaque (fig. 91). In the above-mentioned series from Garden Canyon, three of the males and four females have these erosions on the head (four elongate deep depressions with a median carina), three males and one female have slight depressions at the back or top of the head, and two males and three females have no depressions at all. As for the

opaque areas, of 26 specimens, 13 have pruinose areas at the base of the pronotum, 10 have them at the base of both pronotum and elytra, and three have no pruinose areas at all. Those individuals without depressions and pruinosity can be distinguished from *cribratella* and *contracta* by their median, not subapical, claws; from *mima* by the absence of a ridge on the abdomen; from *hebes* by the more often truncate, not emarginate, clypeus and sunken labrum; and from *carinata* by the sparser pronotal punctures and absence of pronotal carina. One specimen has the apical half of the pronotum eroded as in *carinata*, but the carina is not present. As in *impar* of the *brevicollis* species group, the pruinose hind angles of the pronotum occasionally show short hairs emerging.

The male genitalia (fig. 151) have the lobes constricted on the inner side before the apex, and the apex is decidedly bulbous and cup-like on the outer side; they are more exaggerated than the genitalia of the other species.

The sometimes tumid clypeus and the shape of the clypeus recall *simplex* Blanchard from eastern and southern Mexico, and Guatemala, but that species has 10-segmented antennae, very large eyes, and other characters that are different.

Diplotaxis contracta Bates

Figure 92

Diplotaxis contracta BATES, 1888 (1887-1888), p. 166 (Ciudad, in Durango [Durango City, Durango, Mexico]; type, female, in British Museum).

DIAGNOSIS: Abdomen ridged, claws subapical. This markedly eroded species resembles *abnormis* because of the opaque impressions on the head, but that species does not have a ridge laterally on the abdomen, and the claws are not abruptly angulate as they are in *contracta*. No other species of the group has the sides of the pronotum so sinuate or so deeply constricted near the base (fig. 92).

RANGE: Known only from the state of Durango. The type from Durango, Durango, 8100 feet, and one other female from 6 miles east of El Salto, Durango, August, 1947, at 8500 feet, have been examined.

DESCRIPTION OF FEMALE: (See diagnostic description of group for characters omitted

here). Length, 7 to 8 mm. Head with a V-shaped ridge behind clypeus, surface behind ridge densely, rugosely punctate at center and eroded and opaque at sides, front half of head depressed and impunctate within the V. Clypeus about one-third of length of head, densely punctate, front margin strongly emarginate, sides sinuate in front of eye. Labrum concave, sunken, nearly impunctate at middle, same length as or longer than reflexed under side of clypeus. Mentum flat, not declivous in front.

Pronotum widest at hind angles, sides deeply emarginate or constricted in front of hind angles, strongly arcuate near middle, then narrowed and sinuate to front angles which are acute, strongly produced anteriorly, and flared a bit outward laterally, surface irregular, with smooth elevated areas and depressed punctate areas, punctures larger than those on head and irregularly placed, base at sides may be opaque; scutellum sparsely punctate. Elytra as in *hebes*.

Abdomen with segments 1 to 5 strongly ridged laterally just under elytral margin, segments 2 to 4 slightly tumid, segment 1 and part of segment 2 also opaque. Claws abruptly angulate, cleft subapically, inner tooth nearly as long as claw, and wider.

SEXUAL DIMORPHISM: No male available for comparison.

REMARKS: Bates did not mention that the abdomen was ridged laterally nor that the antennae have but nine segments (nor did he notice this last character in his *hebes* or *cribratella*); he considered the species unusual for its strongly narrowed pronotum and hollow labrum. The pronotum of *abnormis* also has prominent hind angles, but lacks the constriction present in *contracta* (fig. 92); the labrum is hollowed out to about the same degree as in other members of the group (*cribratella*, *abnormis*, and *carinata*). The only other member of the group with the abdomen ridged is *mima*, which has medially, not subapically, cleft claws. The tumid abdominal segments are found also in both sexes of *carinata*, and in some males of *hebes* and *cribratella*. A small tubercle with a tuft of hairs emerging is quite conspicuous at the corner of the humerus in *contracta*, but is present in other species to a lesser degree.

The type has one elytron missing, so shows the ridged abdomen clearly. The head, and also the base of the pronotum and of the elytra, are eroded and opaque, but in the other specimen examined only the head is opaque, the other parts being shining. It is assumed that the male, when found, will have the abdomen sericeous as in the other males of the group.

SPECIES GROUP *mus*

Diplotaxis mus Fall

Figures 96, 153

Diplotaxis mus FALL, p. 192 (Cochise County, Arizona; type, male, in Museum of Comparative Zoölogy).

DIAGNOSIS: Vestiture white and scaly, antennae 10-segmented, abdomen not ridged. No other species resembles this one, with its exceedingly broad, squat clypeus rounded in front, its heavy white scales, short, straight-sided pronotum (fig. 96), and hind femora that are very strongly arcuate, almost bulbous, at the middle. The male has long, non-cleft front claws, the inner claw longer than the outer.

RANGE: State of Chihuahua in northwestern Mexico, and southern Arizona. The total number of specimens examined is 107. (See Appendix for locality data.)

DESCRIPTION: Color, piceous, often appearing grayish when scales are all present. Length, 6 to 7 mm. All of dorsum, pygidium, and under side with broad, dense, appressed, white scales. Head with front flat, descending abruptly and without interruption to clypeus which is on same plane, surface of head and clypeus finely, densely punctured. Clypeus from one-quarter to one-half of length of head, very broad, angles broadly rounded, front margin not reflexed, nearly straight, lateral margins oblique. Each eye about one-fifth of width of head. Antennae 10-segmented, club as long as funicle. Maxillary palpi with flattened basal area. Mandibles large, stout. Labrum deeply hollowed out, concave, four or five times wider than long, shallowly curved in front, longer medially than reflexed under side of clypeus. Mentum flat, slightly convex in front, but with no anterior declivity.

Pronotum with scales always denser at

angles, transverse, scarcely longer than head and clypeus combined, widest at middle, but sides nearly straight, front angles acute, hind angles sharply obtuse, punctures about same size as on head but sparser; scutellum densely punctured. Elytra with scales in all punctures, punctures larger and denser than on pronotum, second interval multipunctate, costae convex and with sparser punctures, costae distinct or sometimes confused, marginal scales appressed, not visible from above. Metasternum depressed at center.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium densely punctured. Front tibiae with basal tooth, when not obsolete, a little in front of middle. Middle and hind tarsi with first segment shorter than second. Hind femora strongly arcuate, almost subangulate at middle. Claws shallowly rounded, cleft shallowly, if at all, tooth subapical, minute, or obsolete. Genitalia as in figure 153.

SEXUAL DIMORPHISM: Front tarsi of male with claw tooth obsolete or lacking, claw as long as fifth tarsal segment and longer than in female, inner claw a little longer than outer. Apex of abdomen of male strongly deflexed, the fourth and fifth segments shorter at middle than in female (by about one-half). Hind tarsi in male with first segment as long as the longer of the tibial spurs (or nearly as long), female with it quite shorter; male with hind tibial spurs narrower than in female.

REMARKS: It is difficult to place this species. I have put it close to the *hebes* group, with which it agrees in the big mandibles, rounded clypeus, male genitalia, and acute front angle of the pronotum; but it lacks the nine-segmented antennae, the male characters, and the pruinosity of that group. It has the scales of the *pilifera* group of species and *clypeata*, but not the advanced quadrate clypeus. It has the thick tarsal segments and stout hind tibiae in the male, the rounded clypeus, and simple claw (but only in the male and on the front legs) of *rudis*, but lacks the tiny bilobed labrum and nine-segmented antennae of that species, and the claws are twice as long in *mus*. It has the non-declivous mentum and hollow labrum of *mentalis* and *conformis*, but the former has a strong clypeal ridge and the latter has median claws.

The simple front claws of the male are

quite striking, because they are so very long and because the inner claw is longer than the outer. The inequality of the front claws is found elsewhere in the genus in the males of *anthracina* and *anxius*, and some of the hairy species of the *puberea* group. Simple claws are also found, in *anxius* and *fossipalpa* of the *moerens* group, and in *rudis* in which the claws are simple on all tarsi and in both sexes. In most males of *mus* the unguis is lacking entirely on the front tarsi, but in some individuals a slight swelling is present where the tooth should be. Even in the female and on the other claws of the males, the unguis is smaller and less conspicuous than in most species; in some males the tooth is virtually obsolete on all legs. It is unusual that Fall did not notice the simple claws, although his type is a male. There is scarcely any difference in the shape of the pygidium between the sexes in this species, but of course they can readily be differentiated by the front claws. The scales, especially below and on the sides of the pronotum, are thicker and more abundant than in the other scaly species (*pilifera*, *hallei*, *clypeata*).

Although described from Arizona (Fall had one example), this species appears more common across the border in Chihuahua. I have seen only one specimen from Arizona in addition to the type, and about one hundred from Mexico.

SPECIES GROUP *rudis*

Two species are included in this group: *Diplotaxis rudis*, LeConte and *rex*, new species.

The species of this group have dorsal hairs and bilobed labrum as in the *cribulosa* group, but are very little like the species of that group in other respects. The abdomen is not ridged as in those species, the clypeus is rounded, not dentiform, angles, and the pronotum is notably convex, with the front angles not acute as in *cribulosa*; even the labrum, although bilobed, is proportionately very much smaller than it is in *cribulosa* and its allies, and it is situated back under the head, not in front prominently as in other species with bilobed labrum (see *knausii*, fig. 48). As in the two species *pilifera* and *hallei*, the present species shows a number of similarities as well as some striking dissimilarities.

Both species occur in the United States: *rudis* in the central and some of the western states, *rex* in southeastern Texas only. Only 53 specimens have been examined.

All the characters are given under *rex*, with which *rudis* is compared.

***Diplotaxis rex* Vaurie, new species**

Figures 99, 154

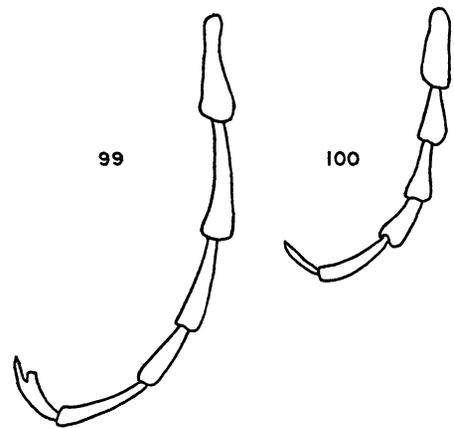
TYPE MATERIAL: Type, male, Norias Division, King Ranch [Kleberg County], Texas, May 25, 1938, C. B. Philip, collector, and three paratypes, same data, in the collection of the American Museum of Natural History.

DIAGNOSIS: Hairs appressed, absent from strial punctures of elytra. Similar to *rudis* in the head (except for the large eyes), clypeus, labrum, mentum, pronotum, front tibiae, and male genitalia, but differs by having the elytra and tarsi long and narrow, not stout, the antennae 10-segmented, not nine-segmented, the pygidium smaller, and all the tarsal claws cleft, not simple.

RANGE: Known only from the type locality in southeastern Texas.

DESCRIPTION OF TYPE, MALE: Length, 8 mm. Head hairy, front descending abruptly to clypeus, clypeal suture not visible, head and clypeus equally densely, rugosely punctured. Clypeus hairy, about one-half of length of head, narrowed obliquely to front, front margin gently sinuate at middle, angles rounded, sides nearly straight; strongly, rather abruptly reflexed. Eyes each about one-quarter of width of head. Labrum bilobed, only one-half of length of reflexed under side of clypeus, lobes small, less than one-half as long as last segment of maxillary palpi. Mentum with anterior declivity more or less cleft at middle, declivity posteriorly margined and pubescent. Antennae 10-segmented, club about as long as all funicular segments combined. Palpi with no noticeable flattened basal area. Mandibles small.

Pronotum hairy, convex, less than twice wider than long, longer than head and clypeus combined, widest at middle where sides are strongly arcuate, angles not impressed or produced, punctures on disc larger and sparser than those on head. Scutellum with a few punctures. Elytra almost three times longer than pronotum, with hairs in interval,



FIGS. 99, 100. Left hind tarsi of *rudis* group. 99. *D. rex*, elongated segments. 100. *D. rudis*, short segments and simple claw.

not in strial, punctures, hairs longer than distance between punctures, punctures of same size and density as those on pronotum; second interval multipunctate; costae flat, scarcely discernible among punctures; marginal hairs of same length as dorsal ones.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium normal in size. Front tibiae with three outer teeth large, equidistant, the basal tooth at middle. Middle tarsi with first segment slightly longer than second. Middle tibiae with spurs about equal in length. Hind tarsi longer than hind tibiae by at least one segment. Hind tibiae with a weak, oblique, setose carina situated nearer apex than base of tibiae. Claws gently curved, cleft nearer apex than middle, but tooth much shorter than claw. Genitalia as in figure 154.

SEXUAL DIMORPHISM: Unfortunately both hind legs are missing in the only female, so that comparisons of the relative lengths of the spurs and first tarsal segments cannot be made. There seem to be no other external differences between the sexes.

REMARKS: This species has the pale straw-yellow color and general narrow shape of *languida* LeConte from Florida, a glabrous species that is otherwise quite different. Comparison with *rudis*, which it most resembles, is given above in the diagnosis. *Rudis* is generally of a darker, reddish brown color.

There is scarcely any variation among the

three paratypes. The dorsal hairs are extremely fine in this species; the middle and hind tarsi are very long and narrow (fig. 99), the first two segments of the middle tarsi being almost as long as the middle tibiae. The fact that the spurs of the middle tibiae are about equal in length, as is true also of *rudis* and some members of the *subcostata* group, may not be significant, because in these other species there is a certain degree of variability, and also the spurs are subject to wear and abrasion.

***Diplotaxis rudis* LeConte**

Figures 100, 154

Diazus rudis LECONTE, 1859, p. 9 ("the black hills" [South Dakota?], type in Museum of Comparative Zoölogy).

DIAGNOSIS: Hairs appressed, absent from striae punctures of elytra. This is the only member of the genus with all claws in both sexes simple, not toothed or cleft. It is further characterized by having nine instead of 10 segments in the antennae, a very large pygidium, bilobed labrum, short, stout femora and tibiae, and partially reduced wings; it differs from *rex* in all these characters except the labrum.

RANGE: Western and central United States from Montana to Texas. Forty-nine specimens have been examined from the following states: *Montana*. *Wyoming*: Torrington, Goshen County. *Oklahoma*: Payne County; Kingfisher; Great Salt Plains; Cherokee. *Nebraska*: Pine Ridge. *Kansas*: Medora; Popenoe; Manhattan. *Texas*. *Arizona*. Only two specimens are females.

HABITAT: Ten specimens from Torrington, Wyoming, were taken by C. and P. Vaurie at 2.5 miles east of town near some sand dunes in July of 1949. I do not remember in what situation they were taken, but it was in the daytime.

DESCRIPTION: Length, 6 to 8 mm. Wings reduced. Head hairy, front sloping gently to clypeus, suture usually obscured by punctures, head and clypeus densely, rugosely punctured. Clypeus hairy, almost as long as head, narrowed obliquely to front margin which is more or less rounded, but often slightly sinuate at middle; broadly but shallowly reflexed. Eyes each one-fifth or one-sixth of width of head. Labrum and mentum

as in *rex*. Antennae nine-segmented, club shorter than funicular segments combined. Palpi and mandibles as in *rex*.

Pronotum hairy, exceedingly convex, definitely longer than head and clypeus combined, widest at middle where sides are strongly arcuate, angles not impressed or produced, punctures generally sparser, larger than those on head, very rugose at sides, center often with impunctate area, sides and base strongly margined. Scutellum more rugose than punctured. Elytra only a little more than twice longer than pronotum, humeri and subapical callosities obsolete because of reduced wings, hairs present in punctures of intervals, not of striae, hairs much longer than distance between punctures, the latter denser than those on pronotum, very rugose and confluent; second interval multipunctate; costae densely punctate, but obscured in maze of punctures; marginal hairs shorter than dorsal ones.

Abdomen, fifth segment as in *rex*. Pygidium large, almost as wide as hind tibiae are long. Front tibiae, first segment of middle tarsi, and middle tibial spurs as in *rex*. Hind tarsi about as long as hind tibiae, the setose carinae as in *rex*. Claws simple, not toothed. Genitalia as in figure 154.

SEXUAL DIMORPHISM: Hind tibial spurs wider in female than in male, but in both sexes the longer spur is longer than the first tarsal segment. Females have an apical flare to the hind tibiae which are rather straight throughout in the male and widen only gradually; tarsal segments are narrower and shorter in female.

REMARKS: Only 30 species of *Diplotaxis* were known at the time (1859) LeConte described *Diazus rudis*. He placed his new genus directly after *Diplotaxis*, stating that its only species differed by having nine instead of 10 antennal segments, and simple instead of cleft claws (he made no mention of the bilobed labrum which is so small that no doubt he could not see it well). Since 1859 seven other species of *Diplotaxis* with nine-segmented antennae have become known, but these do not have simple claws. The simple claws, however, are not unique. They are present in other species of the genus (only in the male sex, it is true, and never on all three pairs of legs as in *rudis*), and therefore

do not seem to offer sufficient basis for the maintenance of a separate genus.

The elytra are short because the wings underneath them are not of full size. Thus a specimen of 7.5 mm. has a wing of only 6 mm., whereas the length of a normal wing exceeds the length of the beetle. The evenly convex appearance of the elytra, without the usual subapical callosities, is also due to the abbreviated wings. The metasternum seems to be no shorter than that in fully winged species. LeConte says that "the rough sculpture and short sparse pubescence give the insect very much the appearance of an *Ochodaeus*." The large convex pronotum and short elytra add to the illusion, although their proportions are not actually so extreme as those of *Ochodaeus*. Superficially *rudis* resembles *coriacea* Bates from the west coast of Mexico, but differs from it in the labrum, mentum, antennae, wings, and legs.

The clypeus was described by LeConte as "hemihexagonal," and a few individuals have it vaguely so, but the majority of the specimens I have examined have it narrowly rounded, with a slight indentation in the middle of the front margin, almost exactly as in *rex*. The middle and hind tibiae and all the tarsal segments are stouter and heavier than in most of the other species, certainly much stouter than the delicate legs of *rex* (fig. 100). The front tibiae, with the three strongly cut-out, equidistant teeth are the same in both species. On two specimens the spurs of the middle tibiae are unequal, not equal, in length. The male genitalia of *rex* and *rudis* are quite similar externally. The phallus and internal sac in *rudis* show no important differences from those of others of the genus; the basal piece is longer than the lobes, as in the *brevidentis* group. The elytra are often very rugose and sometimes have vague depressions and irregularities; the sutural interval is often noticeably elevated, especially basally and around the scutellum. The pygidium has faint depressions laterally in some specimens. Of 49 individuals examined from a dozen localities, only two are females; about half of the specimens have no dates, so that one cannot say if this discrepancy is caused by different emergence time of the sexes. Twenty-seven specimens were dissected before the first female was

found, when the difference in the shape of the hind tibiae and of the hind tibial spurs made it possible to recognize the sexes without dissection.

The species was described from "two specimens from the black hills: Dr. W. A. Hammond." This locality I assume to be the Black Hills in the western part of South Dakota, but LeConte's paper is called the "Coleoptera of Kansas and eastern New Mexico," and Dakota is not mentioned by name in the paper. Hammond, however, is said to have collected insects on his trip from Fort Riley, in Kansas, to Bridger's Pass, probably Fort Bridger, Wyoming, so that his specimens were not restricted to Kansas and New Mexico. In support of this opinion, Fall (1909, p. 47), in discussing *obscura* LeConte, says the "type was taken in the Black Hills (Dakota) by Dr. Hammond." Both Leng (1920, p. 255) and Dalla Torre (1912, p. 150) give only Kansas as locality for *rudis*. Unfortunately, the only notes I have on this species from visits to the LeConte collection in Cambridge are that there were examples there from Cherokee, Oklahoma, and from Montana; evidently I did not see the type.

SPECIES GROUP *rockefelleri*

The following species comprise this group: *Diplotaxis rockefelleri* Vaurie and Cazier and *indigena* Vaurie and Cazier.

The two species of this group are very similar to each other and occur in the same area of northwestern Mexico, even in the same locality (San Juan del Rio, Durango). They seem to have no close affinities to the other dorsally hairy species. The clypeus is different from that of all the hairy species, except the *sparsesetosa* group in which the clypeus is almost a true semicircle. In the present group the clypeus is not a semicircle, but is more or less evenly rounded (much as in *rufiola* Fall), not indented at the sides or front, with no sharp front angles. The male genitalia have the inner lobes joined in the basal sixth, more basally than in other hairy species.

Both these species were described recently, and no new material has been seen; they are redescribed here to conform with the present treatment which makes use of some different characters. All the characters of the group

are given under *rockefelleri*, with which *indigena* is compared.

***Diplotaxis rockefelleri* Vaurie and Cazier**

Figures 95, 155

Diplotaxis rockefelleri VAURIE AND CAZIER, 1955, p. 5, figs. 1, 3B (San Juan del Rio, Durango, Mexico; type, male, in the American Museum of Natural History).

DIAGNOSIS: Head and pronotum virtually glabrous, elytra with short hairs in interval punctures only, abdomen not ridged. Very similar to *indigena*, but without the abundant dorsal hairs present in that species. Differs further by having fewer and larger elytral punctures.

RANGE: East central Durango, northwestern Mexico. Fourteen specimens have been examined: the type and 10 paratypes from San Juan del Rio, Durango, July, 1947, at 5200 feet, and three paratypes from 2 miles south of Menores de Arriba, September, 1950.

DESCRIPTION: Length, 7 to 8 mm. Head and clypeus equally densely punctured. Clypeus with a few hairs at front; more than half of length of head; front margin straight, rounded off to the sides, margins scarcely reflexed. Eyes each about one-fifth of width of head. Antennae 10-segmented. Maxillary palpi with flattened basal area. Mandibles not large or stout. Labrum flat, longer than reflexed under side of clypeus, sometimes twice as long. Mentum flat, anterior declivity feebly indicated by hairs.

Pronotum with fine punctures as on head, but sparser at least on disc, sides arcuate behind middle, angles not acute or impressed; scutellum irregularly punctate. Elytra with hairs present in interval, not in strial, punctures, hairs shorter than distance between punctures, punctures twice as large as those on pronotum; second interval multipunctate, occasionally irregularly unipunctate; costae convex with more widely separated punctures; marginal hairs shorter than base of scutellum, but longer than dorsal hairs.

Abdomen not ridged laterally, fifth segment without groove above pygidium. Pygidium densely punctured as on sides of abdomen. Front tibiae with three teeth equidistant, basal tooth in front of middle. Middle tarsi with first segment a little longer

than second or about equal in length; hind tarsi longer than hind tibiae. Claws toothed subapically but not abruptly bent (about as in fig. 6). Genitalia as in figure 155.

SEXUAL DIMORPHISM: Males with narrower femora and tibial spurs, longer tarsi, more transverse pygidium, longer hind first tarsal segment.

REMARKS: There are actually minute hairs emerging from the punctures of the "glabrous" head and pronotum, but the hairs are too small to be visible at $\times 14$ power. In view of the great similarity of this species and *indigena* (which follows), one might well question whether the absence of hairs on the head and pronotum and strial punctures of *rockefelleri* is not caused by wear. The hairs are, in fact, quite worn on most of the specimens, but a careful examination of the elytra shows that there are always some hairs on the broad and narrow interval punctures, but none on the strial punctures, whereas in all specimens of *indigena* all punctures are strikingly hairy. If the denuded appearance of *rockefelleri* were caused by wear, then one would expect at least some of the punctures of the striae to have a few hairs remaining; it would be a long chance that only the strial punctures should be denuded. The male genitalia appear identical in the two species (fig. 155).

Bates (1887-1888, p. 163) had a very abraded specimen of this species, which I have seen, from "Mexico." He thought it was allied to *arctifrons*, a species that is quite different in my opinion.

***Diplotaxis indigena* Vaurie and Cazier**

Figures 155, 156

Diplotaxis indigena VAURIE AND CAZIER, 1955, p. 6, figs. 1, 3B (Nombre de Dios, Durango, Mexico; type, male, in the American Museum of Natural History).

DIAGNOSIS: Hairs short, of equal length, depressed, present in all punctures, abdomen not ridged. Differs from the similarly shaped and closely related *rockefelleri* by having uniform pubescence in all dorsal punctures, not just on the interval punctures of the elytra, and by having more rows of smaller, finer punctures on the intervals.

RANGE: Durango and southern Chihuahua in northwestern Mexico. Material examined

consists of 35 specimens as follows: *Durango*: Nombre de Dios, August, 1947, September, 1950, 5900 feet, 27 (the type and paratypes); San Juan del Rio, July, 1947, 5200 feet, two paratypes. *Chihuahua*: Santa Barbara and 63 miles west of Santa Barbara, July, 1947, 5500 to 6300 feet, six paratypes.

DESCRIPTION: Length, 7.5 to 9 mm. Head and clypeus hairy, otherwise as in *rockefelleri*, except that front margin of clypeus is more reflexed and occasionally slightly emarginate. Eyes, antennae, palpi, mandibles, labrum, and mentum as in *rockefelleri*, but mentum has a more evident anterior declivity. Pronotum and scutellum as in *rockefelleri*, but with hairs present in all punctures. Elytra with hairs in all punctures, hairs slightly longer than distance between punctures, the latter of same size as those on pronotum and of same density; second interval multipunctate, costae convex or flat, with dense, often smaller punctures; marginal hairs more than twice as long as dorsal hairs. Abdomen and pygidium as in *rockefelleri*. Front tibiae with basal tooth a little removed from apical teeth and near or in front of middle. Middle tarsi, hind tarsi, and claws as in *rockefelleri*. Genitalia as in figures 155 and 156.

SEXUAL DIMORPHISM: As in *rockefelleri*.

REMARKS: Another species with similar, uniformly short, depressed pubescence is *coriacea* Bates which occurs also in Durango as well as farther south, but it is smaller, has an exaggerated bulge to the sides of the pronotum (fig. 93), not present in *indigena*, and a long, scooped-out, quadrate clypeus with indented sides. There are also four species in the *puberea* group with similar dorsal vestiture, but these, among other differences, have dense hairy pads on the soles of the tarsi. (See remarks under *rockefelleri*).

SPECIES GROUP *sordida*

Two species comprise this group: *Diplo-taxis vandykei*, new species, and *sordida* Say.

The two species of this group are the only ones in the eastern part of the United States that are dorsally hairy. They are characterized by the almost complete absence of costae on the elytra (the surface is a maze of extremely fine, rugose, confluent punctures, with the sutural interval and costae only occasionally visible as slight elevations),

strongly sinuate clypeus, convex labrum, stout, large mandibles, and polished, impunctate, transverse area at the top of the head. They occur along the eastern seaboard from Maine to Florida and Mississippi, and in scattered inland localities, but have not been taken west of the Mississippi River.

I am not sure where these species belong in relation to other groups; perhaps they are close to *liberta* Germar and its allies.

Group and specific characters are given under *vandykei*, with which *sordida* is compared.

Diplo-taxis vandykei Vaurie, new species

Figures 101, 157, 158

TYPE MATERIAL: Type, male, Mobile, Alabama, December 18, 1939, Van Dyke collection in the California Academy of Sciences. Fifteen paratypes (nine males, six females) with same data, also one female from Spring Hill, Alabama, October 30, 1910, (H. P. Loding). Paratypes are in the California Academy of Sciences, the American Museum of Natural History, and the Geological Survey of Alabama at University.

DIAGNOSIS: Hairs in all punctures (short, equal in length), abdomen not ridged. Similar to *sordida* in most characters and very closely related, but the front angles of the pronotum are rounded off, not drawn forward to an acute angle as in *sordida* (figs. 101, 102), the disc of the pronotum has some impunctate areas, is not covered uniformly with punctures as in *sordida*, the pronotum is shorter, the sides not sinuate in front, the unguis of the claws a little less apical (fig. 5), not so stout as in *sordida*. The humeral umbone is bare of hairs and usually impunctate, but hairy and densely punctured in *sordida*.

RANGE: Area around Mobile, Alabama.

DESCRIPTION OF TYPE, MALE: Length, 10 mm. Head and clypeus combined scarcely shorter than pronotum. Head hairy, descending steeply to clypeus, finely, densely, rugosely punctured except for shining, impunctate, transverse area at top near margin of pronotum. Clypeal suture impressed on sides in front of eye. Clypeus hairy, about one-third of length of head, with same punctures as on head, front margin narrowly reflexed, so strongly sinuate at middle as to show edge of labrum, angles broadly rounded,

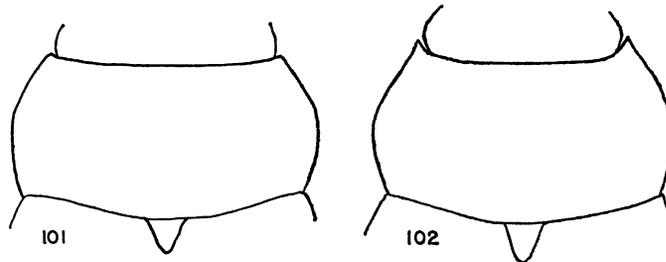
a shiny, impunctate, transverse carina present on sides in front of suture. Eyes about one-sixth of width of head. Antennae 10-segmented, club not quite so long as funicle, second segment of funicle much longer than wide, remaining segments round. Palpi with indistinct, flattened, basal area. Mandibles large, covering front of mentum. Labrum scarcely punctured, concave behind, convex in front, the convexity extending beyond the surface of the under side of the clypeus; same length at middle as reflexed under side of clypeus. Mentum rather flat, declivity, in anterior third, limited at base by arcuate, pubescent margin.

Pronotum with hairs very short as on elytra, punctures larger, sparser on disc than

segment longer than second; hind tarsi at least as long as hind tibiae. Claws gently curved, toothed near middle (just in front of it), tooth shorter than claw and no thicker. Genitalia as in figures 157 and 158.

SEXUAL DIMORPHISM: Male (type) with hind tarsi longer than hind tibiae and longer than in female. Male with fifth abdominal segment shorter than fourth and shorter than in female; with first segment of hind tarsi as long as spur, female with it shorter, but spurs in both sexes equally narrow. Femora of female wider than those of male and pygidium less transverse.

REMARKS: The species is named for the late Dr. E. C. Van Dyke who had marked the Mobile specimens in his collection as "n. sp."

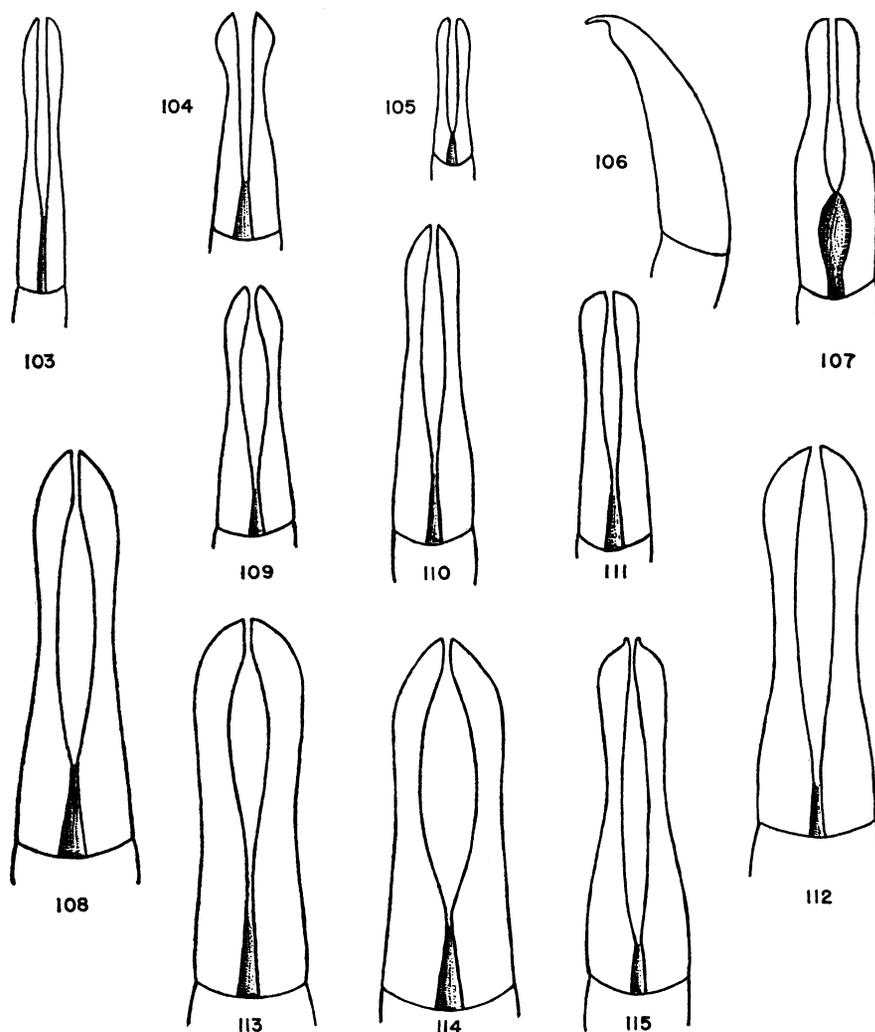


FIGS. 101, 102. The *sordida* group of *Diplotaxis*. 101. *D. vandykei*. 102. *D. sordida*, showing acute front angles of pronotum.

on sides where they are also rugose and confluent and same size as those on head, disc with irregular impunctate space down center, sides strongly angulate at middle, thence obliquely narrowed to front and hind angles, front angles impressed, obtuse, not produced; scutellum densely punctured, except at apex. Elytra with minute hairs in all punctures, hairs shorter than distance between punctures, punctures confused, confluent, about same size and density as those on pronotal disc, costae and intervals appearing as one scarcely differentiated surface; sutural interval not distinct, marginal hairs with short, dense hairs interspersed with hairs about twice as long. Metasternum with elongate depression at middle base, its apex triangular.

Abdomen without any lateral ridge, fifth segment with shallow groove above pygidium. Pygidium with fine touching punctures as on rest of body. Front tibiae with third or basal tooth near middle. Middle tarsi with first

It is remarkably similar to *sordida*, especially to the short-haired specimens described by Schaeffer as *rugosoides*, but it differs notably and consistently in the shape of the pronotum (fig. 101) and the pronotal angles. In some species, such as *brevicollis* and *impar*, the angles of the pronotum may vary quite a bit in shape and sharpness within the species, but in the case of *vandykei* there are also other differentiating characters between it and *sordida* (the humerus, the punctuation, and claws) which, especially in conjunction with the fact of its restricted range, seem to indicate that it is a distinct species. It occurs within the range of *sordida*, although farther to the south in Alabama, the type and paratypes being from the area around Mobile. I have seen quite a few specimens of *sordida* from northern Alabama and one specimen from Monroe County not far north of Mobile. This species occurs in Mississippi to the west and in Georgia to the east, as well as else-

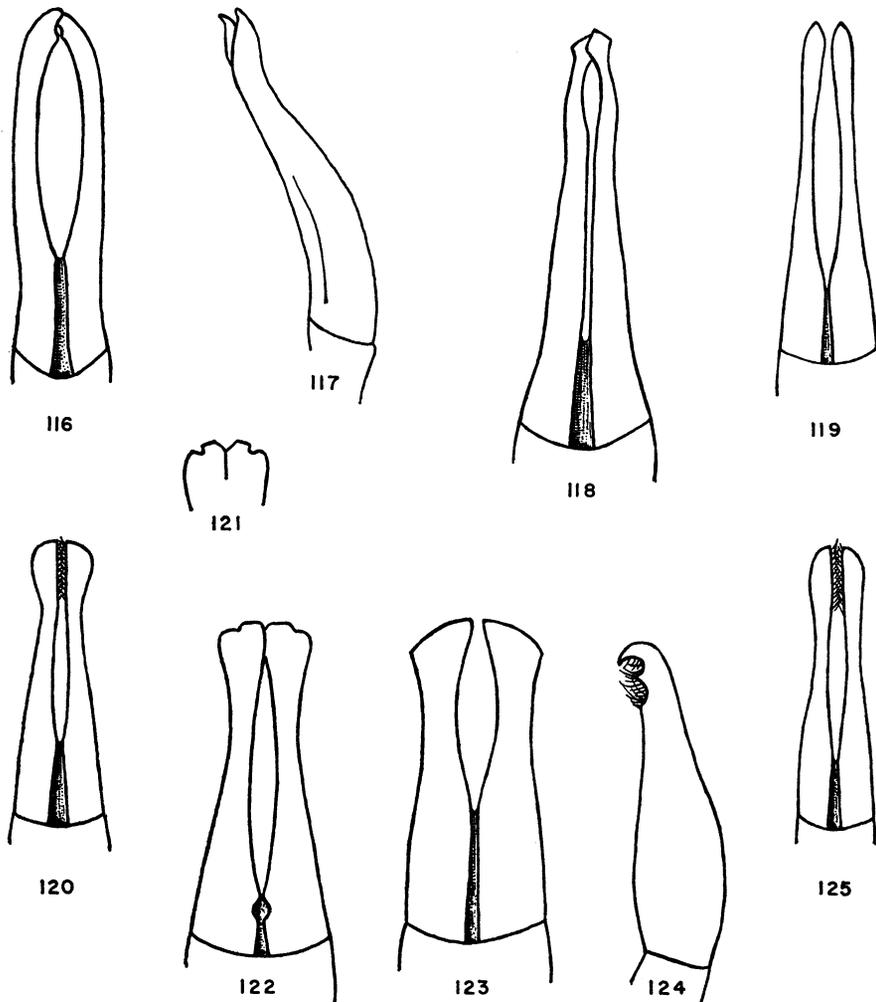


FIGS. 103–115. Lateral lobes (parameres) of male genitalia of *Diplotaxis*, showing part of basal piece. Views are dorsal unless otherwise stated. 103. *D. corrossa*. 104. *D. hallei*. 105. *D. clypeata*; characteristic also of *D. aenea*. 106. *D. pilifera*, profile. 107. *D. pilifera*. 108. *D. bowditchi*; characteristic also of *D. brevopilosa* except that the lobes are joined nearer the base than shown. 109. *D. tarsalis*. 110. *D. spina*. 111. *D. jacala*; characteristic also of *D. pubipes* and *D. maya*. 112. *D. puberea* from Tuxtla Gutierrez. 113. *D. microtichia*. 114. *D. simillima*. 115. *D. puberea*.

where on the Atlantic seaboard. The male genitalia appear similar to those of *sordida* (fig. 157).

The size range in the paratypes is from 9.5 to 12 mm. All except one of the specimens have some kind of irregular, impunctate, polished area near the center of the pronotum. In some the center has denser punctures than in others. Although there are a few punctures

on the elytral humeri in the type and some of the paratypes, they are not dense as in *sordida*, and the humeri, when viewed from above, are polished, not hairy as in *sordida*. There are no depressions around the scutellum as are present in some *sordida*. The clypeal carinae are more marked in some of the paratypes, and these carinae are present occasionally in individuals of *sordida*. The



FIGS. 116-125. Lateral lobes of male genitalia of *Diplotaxis*. Views are dorsal unless otherwise stated. 116. *D. ohausi*. 117. *D. ohausi*, profile. 118. *D. zeteki*. 119. *D. knausii*; characteristic also of *D. moerens* and *D. anxius*. 120. *D. fissilabris*. 121. *D. illustris*, enlarged view of apices. 122. *D. illustris*. 123. *D. fossipalpa*. 124. *D. fossipalpa*, profile. 125. *D. aulacochela*; characteristic also of *D. brevidens*.

front tarsi are very short in both sexes, as also in *sordida*, being scarcely longer than the front tibiae, their segments scarcely longer than wide.

Diplotaxis sordida Say

Figures 102, 157

Melolontha sordida SAY, 1825, p. 197 (United States, here restricted to New Jersey; type destroyed).

Diplotaxis carbonaria BURMEISTER, 1855, p. 262 (North America; type in Martin-Luther-Univer-

sität, Zoologisches Institut, Halle).

Diplotaxis rugosoides SCHAEFFER, 1907, p. 61 (Hampton, New Hampshire; type in United States National Museum).

DIAGNOSIS: Hairs in all punctures (short, long, or both short and long), abdomen not ridged. Differs from the quite similar *vandykei* by having the front angles of the pronotum exceedingly acute and produced (fig. 102), the sides strongly sinuate, the pronotal punctures denser, finer, and more uni-

form, and the hairs usually longer. The claws have the tooth somewhat more apical (fig. 6), and the humeri of the elytra have a punctate and hairy surface, not shining and smooth.

RANGE: United States in the eastern coastal states from Maine south to Mississippi on the Gulf of Mexico; also inland in Michigan, Indiana, Ohio, Tennessee, and Ontario, Canada. Material examined is composed of about 200 specimens from more than 60 localities. (See Appendix for locality data; actual localities are given only where pertinent.)

HABITAT: The only information available on the ecology of this species is that it was "dug up at base of big white pine" at Sherborn, Massachusetts, in May (C. A. Frost, *in litt.*).

DESCRIPTION: Length, 10 to 12 mm. Head, clypeus, eyes, antennae, and mandibles as in *vandykei*, except that clypeus usually lacks the impunctate carina in front of the eye, and the suture is usually obscured by punctures. Palpi, labrum, and mentum as in *vandykei*.

Pronotum hairy, hairs usually but not always longer than those on elytra, densely punctured with fine punctures as on head, sides strongly arcuate behind middle, thence sinuate to acute and produced front angles, front and hind angles impressed, base broadly impressed except at middle; scutellum as in *vandykei*. Elytra with long or short hairs in all punctures (longer hairs on disc), punctures of same size and density as on pronotum and appearing finely reticulate; costae and intervals not separable; surface often with depressions inside humeri and behind scutellum; marginal hairs short and dense, some no longer than shortest dorsal hairs. Metasternum, abdomen, pygidium, front tibiae, and tarsi as in *vandykei*. Claws gently curved, toothed subapically, tooth shorter and thicker than claw. Genitalia as in figure 157.

SEXUAL DIMORPHISM: As in *vandykei*.

REMARKS: This species is discussed in more detail under *vandykei*. In fresh specimens with long hairs, the pronotum in *sordida* appears to be covered with a yellow fuzz somewhat as in specimens of *puncticollis* Moser from Mexico and Guatemala. An in-

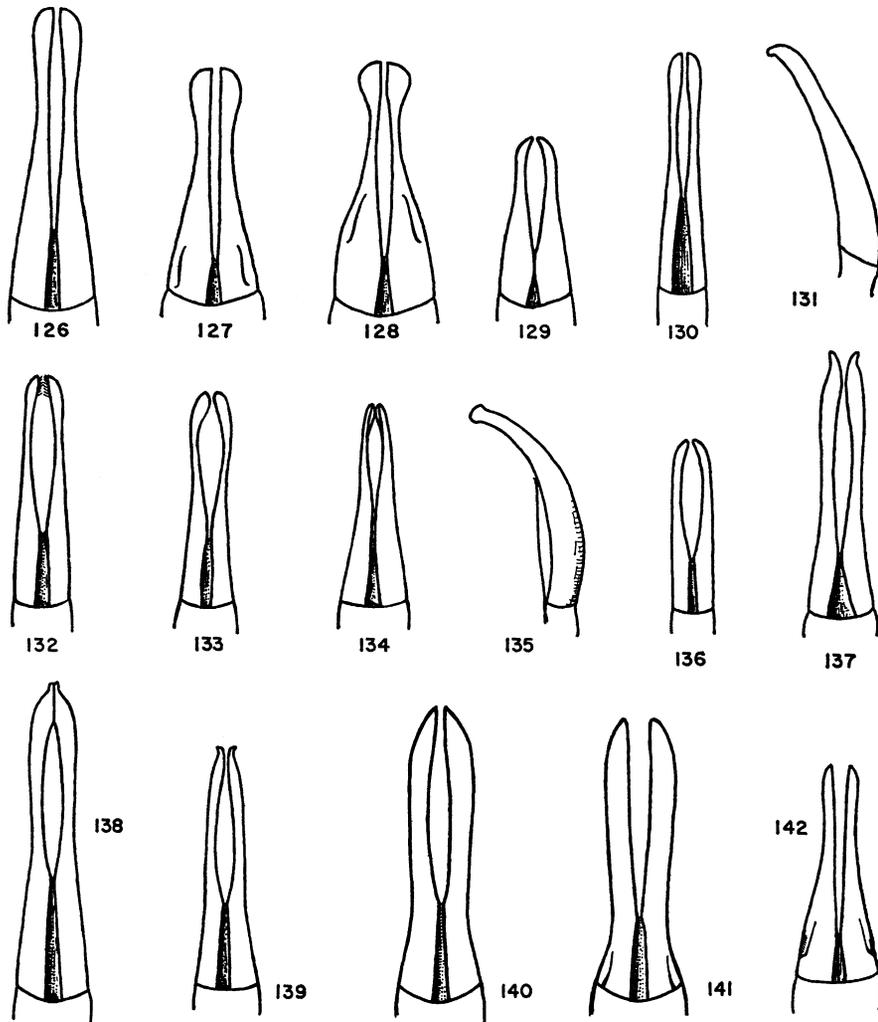
dividual from Southern Pines, North Carolina, while otherwise agreeing with the species, has two large, impunctate, polished areas on the pronotum. The setose carinae on the hind tibiae are quite marked, as in *cribulosa* LeConte. The outer rim of the elytra is often widened apically, as in *tarsalis*, *vandykei*, and some other species (fig. 35).

Some individuals have the dorsal hairs so much shorter than others that it seems as if they represented distinct species, as so considered by Schaeffer when he described *rugosiodes*. With additional material available from many localities, this difference in length of hairs, as in the cases also of the Mexican species *poropyge* Bates and *puncticollis* Moser, seems to lose its significance. The short-haired form has been synonymized already (Vaurie, 1956), and this viewpoint has been confirmed only by examination of additional specimens. No characters were found to differentiate the short-haired form except the shortness of the hairs on the elytra, and even this character proves relative in some instances. From the same localities we have combinations of long hairs or short hairs on the pronotum, with long or short hairs, or both, on the elytra. All specimens of *vandykei*, on the other hand, have short hairs.

Through the courtesy of Dr. Husing of Halle, I have examined the type of *carbonaria* Burmeister, which is a worn female specimen with short hairs throughout. LeConte had placed this name in synonymy in 1856.

A number of new localities have been added to the range of the species since my previous paper (1956, p. 8), including the states of Maine, Rhode Island, South Carolina, Tennessee, Alabama, Ohio, and Indiana, and Ontario, Canada.

In the front angles of the pronotum, the labrum, and the shape of the clypeus, this species resembles *liberta* Germar, found also along the coast, but *liberta* has no dorsal hairs, no depressions, and has well-marked elytral costae. Some of the hairy members of the *puberea* group resemble the short-haired individuals of *sordida* superficially, but these species all have hairy tarsal pads in both sexes and the elytra not quite so rugose or with so many confused punctures as in *sordida*.



FIGS. 126-142. Lateral lobes of male genitalia of *Diplotaxis*. Views are dorsal unless otherwise stated. 126. *D. obregon*. 127. *D. c. cribulosa*; characteristic also of *D. mimosae*. 128. *D. cribulosa sinaloa*. 129. *D. guatemalica*. 130. *D. puberula*; characteristic also of *D. subrugata*. 131. *D. puberula*, profile. 132. *D. hirsuta*. 133. *D. poropyge*. 134. *D. puncticollis*; characteristic also of *D. cavifrons* and *D. crinigera*. 135. *D. puncticollis*, profile. 136. *D. coriacea*. 137. *D. selanderi*. 138. *D. costanera*. 139. *D. pilipennis*. 140. *D. tarascana*. 141. *D. zapoteca*. 142. *D. arizonica*.

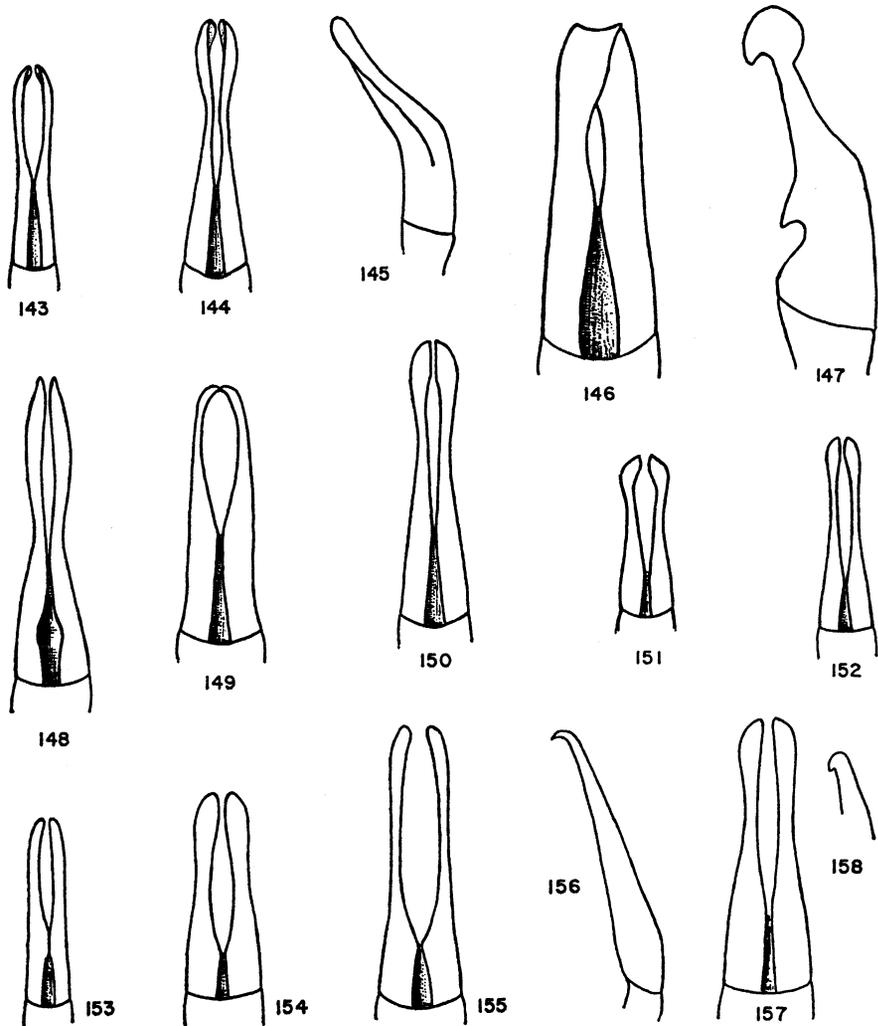
INCERTAE SEDIS

None of the types of Blanchard's species of *Diplotaxis* (1850) were found in the Muséum Nationale d'Histoire Naturelle in Paris, although the types of his *Phyllophaga* were there. Whereas most of the 10 species he described have been readily identified, there are three that cannot be identified, and these

I am placing here. If the types should ever be found, no doubt some recently described species will prove to be synonyms, but they will at least have a uniform description with others of the genus.

Diplotaxis nitidicollis Blanchard

Diplotaxis nitidicollis BLANCHARD, 1850, p. 171 (Mexico).



FIGS. 143-158. Lateral lobes of male genitalia of *Diplotaxis*. Views are dorsal unless otherwise stated. 143. *D. alutacea*; characteristic also of *D. carinifrons* and *D. aereomicans*. 144. *D. jamaicensis*. 145. *D. jamaicensis*, profile. 146. *D. fossifrons*. 147. *D. fossifrons*, profile. 148. *D. metallescens*. 149. *D. simplex*. 150. *D. rita*. 151. *D. abnormis*. 152. *D. carinata*. 153. *D. mus*. 154. *D. rex*; characteristic also of *D. rudis*. 155. *D. indigena*; characteristic also of *D. rockefelleri*. 156. *D. indigena*, profile. 157. *D. vandykei*; characteristic also of *D. sordida*. 158. *D. vandykei*, profile of apices.

"*Statura praecedentis [cribraticollis], paulo brevior; capite laxe punctato, clypeo rugoso, lato, angulis prominentibus. vix productis; prothorace lato, supra nitido, punctis minutis, distantibus, interstitiis laevibus; scutello subtiliter punctato; elytris bigeminato-striatis, punctatis, punctis in seriebus longitudinalibus dispositis; pedibus rufis, tibiis anticis bidentatis; abdomine nitido, vage punctato. Long. 9 millim.*"

This is probably one of the species of the

trapezifera group. There are not many species with the front tibiae bidentate, but either the tibiae were worn, or Blanchard could not see the third tooth because he gives "*tibiis anticis bidentatis*" also for *cribraticollis*, which has them tridentate.

Diplotaxis rugosipennis Blanchard

Diplotaxys rugosipennis BLANCHARD, 1850, p. 172 (Mexico).

"*Ovata, fusco-aenea; capite rugoso, clypeo*

reflexo, angulis prominentibus, acutis; antennis palpisque rufis; prothorace crebre punctato-rugoso; scutello rugoso; elytris parum convexis, bigeminato-striatis, crebre punctatis; punctis latis, passim confluentibus, seriatim dispositis; pedibus rufis; tibiis anticis, obtuse dentatis; abdomine punctato-rugoso, pygidio rufo. Long. 8 millim."

This form may be part of the *aenea* group. Bates (1887-1888, p. 161) said his *corrosa* was "apparently allied in some respects to *D. rugosipennis*, Blanch." Burmeister (1855, p. 264) thought that *rugosipennis* was close to his *Liogenys pauperata*, now considered a synonym of *aenea* Blanchard. He does not say, however, that he had seen the species, and Bates had not seen it (p. 166).

***Diplotaxis ebenina* Blanchard**

Diplotaxis ebenina BLANCHARD, 1850, p. 170 (Martinique).

"*Omnino atra, sat nitida; capite lato, crebre punctato, clypeo truncato; antennis ferrugineis; prothorace brevi, lato, subconvexo, crebre punctato, medio fere laevi, lateribus foveolato; scutello punctato; elytris basi thoracis latitudine,*

postice paulo ampliatis, dense profundeque punctatis, ter-geminato-striatis; pedibus nigris, tarsis piceo-rufis; abdomine fere glabro, punctato. Long. 14 millim."

The only mention of this species since its description is by Burmeister (1855, p. 262), who evidently saw a specimen, as he added the notation "♀" to his Latin description. In his German description he mentions two characters not included by Blanchard, namely, two slight pits in the forehead and a faintly impressed longitudinal stria on the pronotum. These characters and those given by Blanchard could agree with *atlantis* Fall, of which I have examined a female (12 mm.) from "Gouadeloupe," with no further data, but presumably the island of Guadeloupe in the Lesser Antilles, about 100 miles north of Martinique. The only other species reported from any part of the West Indies is *jamaicensis* Cazier from Jamaica, a species with minute dorsal hairs and the sides of the abdomen strongly ridged. There is always the possibility that *ebenina* is not a *Diplotaxis*, as was found to be the case with two other species mentioned in the Introduction.

APPENDIX: SPECIMENS EXAMINED

FOR CONVENIENCE, THE SPECIES are listed alphabetically. Species for which only a few localities have been reported are not listed here; these localities are given in the paragraphs on range under the respective species in the text.

Diplotaxis abnormis Fall

UNITED STATES: *Arizona*: Chiricahua Mts.; Garden Canyon, Huachuca Mts.; Madera Canyon, Santa Rita Mts.; Ramsey and Sunnyside Canyons, Huachuca Mts.; Patagonia Mts., west slope. *New Mexico*: 1 ♀ (type), 1 ♂.

MEXICO: *Chihuahua*: San Jose Babicora, July, 1947, 1 ♂, 3 ♀. *Sonora*: 6.

Diplotaxis aenea Blanchard

Durango: Tepehuanes; Nombre de Dios; Encino; San Juan del Rio; San Lucas; Pedricena; Villa Madero; Durango. *Zacatecas*: Fresnillo; Guadalupe; Somberete. *Aguascalientes*. *Guanajuato*: Guanajuato; San Miguel Allende; Gonzalez; Silao. *Queretaro*: Kilometer 320 near Hacienda Balvanera. *Jalisco*: San Juan de los Lagos; Encarnacion de Diaz. *Michoacan*: Jacona. *Guerrero*: Chilpancingo. *Distrito Federal*: Santa Fe; San Angel; Mixcoac. *Mexico*: Chapingo; Tultenango; Teotihuacan. *Morelos*: Cuernavaca. *Tlaxcala*: Huamantla. *Puebla*: Tecemachalco; Puebla; Esperanza; Atlixco; Chipilo; Los Molinos. *Hidalgo*: Pachuca. *Veracruz*. *Oaxaca*: Huahuapan; Tejupan.

Diplotaxis anxius LeConte

Arizona: Bill Williams Fort; East Bridge; Ehrenberg; Huachuca Mts.; Laguna; Laguna Dam; Mesa; Parker; Phoenix; Prescott; Salome; San Luis; Yuma. *Utah*: Washington; Virgin. *California*: Blythe; Brawley; Calipatria; Holtville; Jacumba; Needles. *Washington*: Olympia Mts.

Diplotaxis arizonica Schaeffer

UNITED STATES: *Arizona*: Chiricahua, Dragoon, Huachuca, Santa Rita, and Santa Catalina Mts.; also Animas, Patagonia, Portal, Tucson.

MEXICO: *Chihuahua*: Matachic, and 2 and 8 miles west of Matachic, 6400 and 7200 ft., July, 1947, 10 ♂, 8 ♀.

Diplotaxis brevidens LeConte

UNITED STATES: *Arizona*: Gila Bend, 1; Gillespie Dam, 1; Phoenix, 6; Quitobato, Organ Pipe Natl. Monument, 6; Sacaton, 1; Salome, 11; San Xavier, near Tucson, 3; Tucson, 1.

MEXICO: *Sonora*: Pitiquito, July, 1952, 1 ♀;

Desemboque, Aug., 1953, 40 ♂, 6 ♀; Tiburon Island, July, 1952, 1 ♂; Puerto Libertad, Aug., 1950, 1 ♂.

Diplotaxis coriacea Bates

Durango: Ventanas, 2000 ft., 4 (including type)*
Sinaloa: Presidio, 2; Venodio [El Venadillo], July, 7. *Nayarit*: San Blas, July, 1956, 4; Navarrete, July, 1953, 6; Santiago Ixcuintla, 1. *Jalisco*: Environs of Guadalajara, 1. *Colima*: Colima, 6; Vulcano [of Colima], 26. *Veracruz*: Cordoba, 1.

Diplotaxis cribratella Bates

Chihuahua: Catarinas, July, 250 (including type of "ennea"); Matachic, July, Aug., 2; Llano de Rio Santa Clara, 27 miles west of Parrita, Aug., 1; Santa Barbara, July, 1; Huejotitlan, July, 1; Santa Clara, 1. *Durango*: Palos Colorados, 8000 ft., Aug., 21; Encino, 6200 ft., July, 216; 6 miles northeast of El Salto, 8500 ft., Aug., 28; Coyotes, Aug., 23; Otinapa, 8200 ft., Aug., 5. *Jalisco*: 15 kilometers south of Mazamitla, 5500 ft., July, 1. *Guerrero*: Omilteme, 8000 ft., Aug., 1 ♀ (type).

Diplotaxis cribulosa LeConte

UNITED STATES: *Arizona*: Virtually entire state from Wickenburg in north to Ajo and Bisbee in south, and in following mountains: Baboquivari, Chiricahua, Coyote, Dragoon, Huachuca, Pajaritos, Pinal, Rincon, Santa Catalina, Santa Rita, and Tumacacori. *New Mexico*: Albuquerque; Frontera (type); Organ; Silver City. *Texas*: Alpine; Davis Mts.; Fort Davis; Marathon; Valentine.

MEXICO: *Sonora*: Alamos and vicinity, 12; Santa Rosa Ranch, north of Navojoa, 18; 10 miles east of Cananea, 2; Cocospera Canyon, 8 miles east of Imuris, 1; 5 miles east of Imuris, 2; Minas Nuevas, 2; Naco, 4; El Oasis, 45 miles north of Hermosillo, 1; 29 miles north of El Oasis, 2; Pitiquito, 1; Desemboque, 1; 25 miles south of Llano, 2. *Chihuahua*: Chihuahua and vicinity, 39; 63 miles west of Santa Barbara, 98; Valle de Olivos, 9; 10 miles south of Las Delicias, 1; Torreon, 1. *Durango*: Rodeo, 30; San Juan del Rio, 256; 35 miles south of El Entronque, 12; 2 miles south of Memores de Arriba, 6; Pedricena, 8; Santa Maria del Oro, 7. *Jalisco*: Guadalajara, 1.

Diplotaxis fissilabris Fall

UNITED STATES: *Arizona*: Baboquivari, Comobabi, Coyote, Santa Catalina, Santa Rita Mts.; also Benson; Congress Junction; Florence; Gila Bend; Globe; Magna; Mescal; Miami; Palo Alto; Robles Ranch, Pima Co.; San Bernardino Ranch,

Cochise Co.; San Carlos; Sierritas; Sonoita; Tucson. *New Mexico*: White City.

MEXICO: *Sonora*: Pitiquito, July, 1952, 1 ♂.

***Diplotaxis fossipalpa* Fall**

UNITED STATES: *Arizona*: Phoenix (type); Tucson. *California*: Blythe, Borrego, Cathedral City; Holtville (type of "*villosipes*"); Indian Well, Coachella Valley; Indio; Magnesia Canyon, Riverside Co.; Palm Springs; Palo Verde; Rancho Mirage; Tanbark Flat, Los Angeles Co.

MEXICO: *Sonora*: Rocky Point [Puerto Peñasco], June, Oct., 87 ♂, 113 ♀; Desemboque, July, 1953, 4 ♂, 7 ♀.

***Diplotaxis hebes* Bates**

Chihuahua: Santa Barbara, 6300 ft., July, 1947, 1 ♂. *Durango*: Durango, 8100 ft., 1 ♂ (type); Palos Colorados, 8000 ft., Aug., 1947, 159; Otinapa, 8200 ft., Aug., 1947, 33; Coyotes, 8300 ft., Aug., 1947, 1 ♂, 2 ♀; 6 miles northeast of El Salto, 8500 ft., Aug., 1947, 15; El Salto, Aug., 1951, 1 ♀. *Michoacan*: 25 kilometers east of Morelia, June, 1955, 6 ♂, 2 ♀. *Mexico*: Toluca, 2.

***Diplotaxis hirsuta* Vaurie**

MEXICO: *San Luis Potosi*: Tamazunchale, Mar. 29, 1951 (John D. Lattin), 242 (including 25 paratypes); Apr., 1952, 42 paratypes; other dates and collectors, 90; Tamazunchale, El Sol, June, 1941 (J. and R. Potts), 3 paratypes; Valles, 12; 50 kilometers east of Ciudad del Maiz, 2250 ft., 3. *Tamaulipas*: Villagran, June, 1951 (P. D. Hurd), 4 paratypes; 2 miles west of Kilometer 619 at Rio Sabinas, 14 paratypes; Ciudad Victoria, 8. *Nuevo Leon*: Montemorelos, 1400 ft., May, 15; Linares, May, 66. *Hidalgo*: 6 miles north of Jacala, 6000 ft., June, 12. *Veracruz*: Orizaba, May, 1941 (R. W. L. Potts), 3 paratypes; Sayula, Apr., 1953 (Bechtel, Schlinger), 65 (including 45 paratypes); Ojo de Agua Grande, Paraje Nuevo, May, 1953, 36 paratypes; Zapuapan de Cabanas, 14 kilometers southeast of Lake Catemaco, Apr., 1953, 7 paratypes; Papantla, 900 ft., Aug., 87; Jesus Carranza, Apr., 26; Cordoba, 2; Coatepec, 3700 ft., Aug. 1; Barranca de Metlac, 1 paratype. *Oaxaca*: St. Lucrecia, Tehuantepec, Apr., 3; Donaji, Apr., 1. *Chiapas*: El Suspiro, Berriozabal, June, 1955 (R. B. and J. M. Selander), 3 paratypes.

GUATEMALA: *Peten*: Tikal, May, 1956 (T. H. Hubbell), 52 (including 10 paratypes). *Alta Verapaz*: San Diego, Apr., 1.

***Diplotaxis illustris* Fall**

UNITED STATES: *Arizona*: Baboquivari Mts., 2 ♂ (including type); Badger, 1 ♂; Congress Junction, 1 ♂; Huachuca Mts., 2 ♂; Kits Peak, Rincon, Baboquivari Mts., 1 ♂; Mescal, Cochise Co.,

1 ♂; Miller Canyon, Palmerlee, 1 ♂, 1 ♀; Patagonia Mts., 4 ♂, 7 ♀; Torque Verdi Ranch, East Fort Lowell, 1 ♂; Tucson, 1 ♂, 4 ♀.

MEXICO: *Sonora*: Pitiquito, July, 1952, 2 ♂, 1 ♀.

***Diplotaxis jamaicensis* Cazier**

Jamaica: Without further locality, the type, ♂, and 6 paratypes; Claremont, Mar., 1931, 1 ♀; Falmouth, Feb., 1931, 1 ♂; Baron Hill, Trelawny, 2; Stony Hill and Constant Spring, St. Andrew, 3; Cinchona, W. Fawcett, Sept., 1 ♂; Blue Mts., 1 ♂ (a number of these foregoing are paratypes); Bath, St. Thomas, Apr., 1937, 2; Bog Walk, St. Catherine, Apr., 1937, 3; Mandeville, Manchester, Apr., 1937, 1 ♂.

***Diplotaxis knausii* Schaeffer**

UNITED STATES: *Arizona*: About 20 or 30 localities in central or southern parts of state. *New Mexico*: Cienega Ranch, near Rodeo; Deming. *California*: Blythe; Borrego; Coachella; El Centro; Holtville; Indio; Magnesia Canyon; Palm Springs; Palo Verde; Ripley; San Felipe Ck., Imperial Co.; Tanbark Flat, Los Angeles Co.; Thermal; Westmorland; Whitewater; Yermo. *Nevada*: Las Vegas; Mesquite.

MEXICO: *Baja California*: San Felipe, June, 1939, 1 ♂, June, 1952, 2 ♀; San Fernando, July, 1939, 1 ♀. *Sonora*: Cocospera Canyon, near Imuris, July, 1952, 1 ♂; Desemboque, Aug., 1953, 43; El Oasis, 45 miles north of Hermosillo, July, 1955, 1 ♂; Kino Bay, June, 1952, 1 ♀; Minas Nuevas, Aug., 1952, 2 ♂, 7 ♀; 25 miles south of Llano, July, 1950, 1 ♂.

***Diplotaxis microtichia* Moser**

Veracruz: Coatepec, 2 ♂ (including type); Atoyac, June, 1941, 1 ♀; La Buena Ventura [not located], July, 1909, 1 ♀; Cordoba, 1 ♀; Huatusco, 1 ♀; Lake Catemaco, July, 1955, 1000 ft., 16 ♂, 28 ♀; Paraje Nuevo [between Orizaba and Cordoba], May, 1952, 2 ♂. *Oaxaca*: 2 ♂. *Puebla*: 34 miles southeast of Acatlan, July, 1952, 1 ♀ [this species or *simillima*?].

***Diplotaxis mimosae* Fall**

UNITED STATES: *Arizona*: Browns Canyon, Baboquivari Mts.; Bear Valley, Tumacacori Mt., 4000 ft.; Carr and Lower Carr Canyons, Huachuca Mts.; Chiricahua Mts.; Cochise Stronghold, Dragoon Mts.; Elgin; Garden Canyon, Huachuca Mts.; Miller Canyon, Palmerlee; Molina Basin, Santa Catalina Mts.; Mt. Lemmon Control Sta., Santa Catalina Mts.; Noon Creek, Mt. Graham; Nogales; Oracle; Sabino Canyon, Santa Catalina Mts.; Santa Rita Mts. (type).

MEXICO: *Sonora*.

Diploptaxis moerens moerens LeConte

UNITED STATES: *Arizona*: About 30 or more localities all over state. *California*: About 25 localities in southern part, and Davis near San Francisco. *Utah*: St. George; Snow Canyon Lookout, 10 miles north of St. George. *Nevada*: Ash Meadow; Goldfield; Kyle Canyon, Mt. Charleston, Clark Co.; Las Vegas.

MEXICO: *Baja California*: San Felipe, 1 ♂; San Fernando, 2 ♂, 6 ♀; El Marmol, 1 ♂, 3 ♀; Catavina, 45; Chapala Dry Lake, 3 ♂, 3 ♀; Punta Prieta, 46; Mesquital, 33; El Arco Mine, 2 ♀; San Ignacio and vicinity, 36; Santa Rosalia, 6. *Sonora*: Desemboque, July, 1953, 1 ♂; Choya Bay [near Puerto Peñasco], June, 1952, July, 1950, 3 ♀; 25 miles south of Llano, July, 1950, 1 ♂, 2 ♀.

Diploptaxis mus Fall

MEXICO: *Chihuahua*: San Jose Babicora, July, 1947, 44; Catarinas, July, 1947, 5800 ft., 1; Kilometer 36, Santa Barbara to Ojito Road, Aug., 6900 ft., 1; Huejotitlan and vicinity, July, 5700 ft., 46; Canyon de la Noria, 7 miles west of Parrita, Aug., 1950, 13.

UNITED STATES: *Arizona*: Cochise Co., 1 ♂ (type); Chiricahua Mts., 1.

Diploptaxis ohausi Moser

GUATEMALA: *Retalhuleu*: Coyotenango, 1 ♂ (type). *Chimaltenango*: Yepocapa, Mar.-Apr., 1953, 1 ♀. *Suchitipequez*: Variedades, July, 1947, 500 ft., 1 ♀. *Solala*: Panajachel, Apr., 1952, 1 ♂. *Sacatepequez*: Capetillo, 1 ♀.

MEXICO: *Chiapas*: "Pacific Slope Cordilleras," 800 to 1000 meters, 1919, 3 ♂, 3 ♀.

HONDURAS: *Francisco Morazan*: Escuela Agrícola Panamericana at Zamorano, July-Aug., 1948, 2550-2600 ft., 1 ♂, 1 ♀. [Zamorano is on Yeguaré River southeast of Tegucigalpa.]

Diploptaxis pilipennis Moser

Chihuahua: Matachic and vicinity, 6400-7200 ft., July, Aug., 22; 12 miles northwest of Gran Morelos, Aug., 1; Santa Clara Canyon, 5000 ft.; June, 7; Cañon Prieto near Primavera, 6500-6800 ft., July, 7; 22 miles south of Minaca, Aug., 1; 5 miles south of Terrero, Aug., 1; 63 miles west of Santa Barbara, 5500 ft., July, 2; Salaices, 5200 ft., Aug., 9. *Durango*: Durango, 6200 ft., Aug., 9; Palos Colorados, 8000 ft., Aug., 7. *Jalisco*: Etzatlan, Aug., 8.

Diploptaxis poropyge Bates

MEXICO: *Veracruz*: Lake Catemaco, 1000 ft., July, 1955, 5. *Chiapas*: Finca Esperanza [not located], Feb., 1939, 1 ♀; 3 miles south of Tonola,

100 ft., Mar., 1954, 1 ♂. *Yucatan*: Chichen-Itza, Mar., 1955, 2.

GUATEMALA: *Baja Verapaz*: San Geronimo, 4 (including type of *poropyge*). *Jalapa*: 8 kilometers east of Jalapa, 1425 meters, May, 1947, 4. *Guatemala*: Guatemala City, Mar., 1952, 1 ♀. *Escuintla*: Paso Antonio, 400 ft., 2; Mirandilla, 1700 ft., 1 ♂. *Retalhuleu*: Cuoytenango, 2.

EL SALVADOR: *Chalatenango*: La Cieba [Las Ceibas], 1 ♂. *Cuscatlan*: El Rosario, 1 ♂. ? Servicios Tecnicos Cafetalera, 1955, 1 ♀.

HONDURAS: Santa Cruz, Apr., 1923, 1 ♂.

NICARAGUA: *Esteli*: Esteli, Apr., 1943, 1 ♀. *Chontales*: 1 ♂.

COSTA RICA: San Miguel de Barranca, Feb., 1940, 20. *Alahuela*: San Carlos, 1 ♂. *Guanacaste*: Bebedero, 1 ♂ (type of "*subrugosa*"); Las Canas, Pacific slope, 50 ft., June, 1923, 1 ♂, Feb., 1943, 14. *San José*: San José, 4. *Cartago*: Turialba, 5.

PANAMA: *Panama*: La Chorrera, May, 1912, 7. *Chiriqui*: Poterillos, 1 ♀; Boquete, May, 1923, 2.

Diploptaxis puberea Bates

Michoacan: Tuxpan, 5500 ft., June, July, 1955, 3 ♂, 2 ♀; 15 miles east of Morelia, July, 1947, 2 ♀ [this species or *bowditchi*?]. *Guerrero*: Amula, 1 ♂; Omilteme, 1 ♀. *Oaxaca*: 3 ♂ (including type), 2 ♀; Oaxaca, 1 ♂, 2 ♀; Etla, 2 ♀; Peras, 1 ♀; Juquila, 1 ♂. *Chiapas*: 4 miles east of Las Rosas, Mar., 1953, 6 ♂, 3 ♀ [Las Rosas is given as Pinola on some maps]; Teopixa [Teopisca?], 1 ♀ [probably this species]; 7 miles west of Tuxtla Gutierrez, Apr., 1953, 2 ♂, 1 ♀ [this species?]; San Cristobal [Las Casas], Apr., 1941, 1 ♀ [this species?]. *Veracruz*: 1 ♀ [this species?].

Diploptaxis puberula LeConte

UNITED STATES: *Louisiana*: Calcasieu Co. *Texas*: Austin, Travis Co.; Boerne, Kendall Co.; "Cave without Name," near Boerne; Brazoria Co.; Cedar Lane, Matagorda Co.; Concan, Uvalde Co.; Fort Sam Houston, Bexar Co.; Georgetown, Williamson Co.; Houston, Harris Co.; Longhorn State Park, Burnett Co.; Mexia, Limestone Co.; Mountain Home, Kerr Co.; New Braunfels, Comal Co.; Palopinto Co.

MEXICO: *Nuevo Leon*: Montemorelos, Apr., 1942, 1 ♂, 1 ♀; 4 miles west of El Cercado, June, 1951, 1 ♂ [south of Monterrey]. *Tamaulipas*: Villagran, June, 1951, 2 ♂, 5 ♀.

Diploptaxis pubipes Schaeffer

MEXICO: *Veracruz*: Papantla, Aug., 1955, 8. *San Luis Potosi*: Tamazunchale, Mar., 1951, 9; Valles, May, 1952, 1 ♂. *Tamaulipas*: Sierra de Tamaulipas, 3 miles northwest of Acuna, 3500 ft., Apr., 1949, 30; Ciudad Victoria, 2 ♂; Hidalgo, June, 1955, 1 ♂; Villagran, June, 1951, 2 ♂, 2 ♀;

10 miles northwest of Zamorina, edge of San Jose de las Rusias Mountains, 1 ♂.

UNITED STATES: *Texas*: Brownsville, 23.

Diplotaxis puncticollis Moser

MEXICO: *Puebla*: Necaxa, 1 ♂, 1 ♀ (type and paratype). *Hidalgo*: 6 miles north of Jacala, 6000 ft., June, 1955, 5 ♂. *Veracruz*: Jalapa, May, 1946, 5; Banderilla, May, 1947, 1 ♀; Cordoba, 1 ♀; Orizaba, June, 1941, 4. *Chiapas*: 16 miles southeast of San Cristobal de las Casas, Apr., 1954, 7200 ft., 1 ♂, 1 ♀; 2 miles northeast of Guadalupe Atodia, Mar., 1953, 7; 4 miles east of Las Rosas, Mar., 1953, 106; 4 miles southeast of Soyalo, Mar., 1953, 2; 7 miles west of Tuxtla Gutierrez, Apr., 1953, 28. *Oaxaca*: Oaxaca, Apr., 1953, 1 ♂; Tehuantepec, July, 1952, 1 ♂.

GUATEMALA: *Guatemala*: Guatemala City, 9. *Solola*: Panajachel, Apr., 1952, 6. *Baja Verapaz*: San Jeronimo, July, 1947, 3000 ft., 1 ♂. *Jalapa*: 8 kilometers east of Jalapa, 1425 meters, May, 1947, 1 ♂.

Diplotaxis simillima Moser

Nayarit: San Blas, 1 ♂ (type), 3 ♀; Tepic, 3000 ft., July, 1953, 2 ♂, 2 ♀, May, 1949, 1 ♂; Mecatan, 300 ft., May, 1949, 1 ♂, 1 ♀; El Cora, Tepic, 3 ♀; Ixtapa, Tepic, 2 ♂. *Morelos*: Cuernavaca, July, 1935, 1 ♂. *Guerrero*: El Mogote, 5000 ft. [near Taxco], June, 1954, 2 ♂, 1 ♀. *Mexico*: Temascaltepec, 8 ♀ [may be this species]. *Puebla*: 34 miles southeast of Acatlan, July, 1952, 1 ♀ [this species or *microtichia*?].

Diplotaxis simplex Blanchard

Tamaulipas: La Pesca, 1. *San Luis Potosi*: Tamazunchale, 8. *Puebla*: 1. *Veracruz*: Veracruz, 4 (including type of "*sinuaticeps*"); Jalapa, 4465 ft., 21; Cordoba, 8; Orizaba, 9; Pajantla, 900 ft., 13; Ojo de Agua Grande, Paraje Nuevo, 3; Lake Catemaco, 1000 ft., about 700; Huatusco, 1; Tierra Colorado, 5. *Chiapas*: Ocosingo Valley, 3. *Yucatan*: 1.

Diplotaxis sordida Say

CANADA: *Ontario*: Queenstown.

UNITED STATES: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Virginia, Tennessee, North Carolina, South Carolina, Georgia, Mississippi, Indiana, Ohio, Michigan. Alabama: The following counties: Etowah, Hale, Cleburne, Bibb, Franklin, Jackson, Monroe.

Diplotaxis subrugata Moser

Tamaulipas: Villagran, June, 1951, 11; 43 kilometers east of Mante, May, 1943, 1 ♂; 29 kilometers south of Hidalgo, July, 1952, 1 ♀; Villa Juarez, 300 ft., June, 1937, 36; 13 miles east of Magiscatzin, May, 1948, 1 ♂. *San Luis Potosi*: Valles, 300 ft., Apr. to June, 62; 20 miles north of Huichihuxan, May, 1952, 1 ♀; Tamazunchale, Apr., May, 1952, 25. *Hidalgo*: Ajacuba, 8000 ft., June, 1937, 4. *Veracruz*: Papantla, 900 ft., Aug., 1955, 357. *Durango*: El Salto, 9300 ft., June, 1937, 1 ♀ [locality?].

Diplotaxis tarsalis Schaeffer

MEXICO: *Mexico*: Amecameca, June, 1907, 1 ♂, 1 ♀. *Hidalgo*: Real del Monte, 1 ♂; Zimapan, June, 1947, 1 ♀. *Michoacan*: Zamora, June, 1956, 1 ♀; 25 kilometers east of Morelia, June, 1955, 3 ♂, 2 ♀. *Jalisco*: Guadalajara, 1 ♀; Matanzas, 7100 ft., June, 1949, 1 ♂, 1 ♀; 15 kilometers south of Mazamitla, 5500 ft., July, 1952, 1 ♂; Tepatitlan de Morelos, Apr., 1953, 1 ♀. *Durango*: Coyotes, 8; El Salto, 19; Encino, 1; Otinapa, 1; Palos Colorados, 12. *Chihuahua*: Matachic and vicinity, 99; San Jose Babicora, 16; Santa Clara and vicinity, 4; Cañon Prieto, near Primavera, 15; Santa Clara Canyon, near Parrita, 2; Nami-quipa, 6; Catarinas, 5; Santa Barbara and vicinity, 25; Balleza, 1.

UNITED STATES: *Arizona*: Chiricahua Mts.; Garden Canyon, Ramsey Canyon, and Sunny-side Canyon in Huachuca Mts.; Madera Canyon, Santa Rita Mts.; Mud Springs, Santa Catalina Mts.; Patagonia; Southwestern Research Sta., 5 miles west of Portal; Webber's Cabin.

BIBLIOGRAPHY

- AMERICAN GEOGRAPHICAL SOCIETY
 1945. Map of Hispanic America, 1:1,000,000. Washington, Government Printing Office.
- ARROW, G.
 1946. Entomological results from the Swedish Expedition 1934 to Burma and British India. *Arkiv. Zool.*, vol. 38A, no. 9, pp. 1-33, pls. 1-2.
- BATES, H. W.
 1887-1888. *Biologia Centrali-Americana. Diplotaxinae*. London, vol. 2, pt. 2, pp. 154-166, pl. 9, figs. 19-26.
 1889. *Biologia Centrali-Americana*. London, suppl., vol. 2, pt. 2, pp. 396-399, pl. 24, figs. 12-13.
- BLACKWELDER, R. E.
 1944. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 2, Scarabaeidae. *Bull. U. S. Natl. Mus.*, no. 185, pp. 197-265.
 1957. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 6, Bibliography. *Ibid.*, no. 185, pp. 927-1492.
- BLANCHARD, E.
 1850. Catalogue de la collection entomologique du Muséum d'Histoire Naturelle de Paris. Paris, vol. 1, pp. 1-240.
- BÖVING, A. G.
 1942. Descriptions of the larvae of some West Indian melolonthine beetles and a key to the known larvae of the tribe. *Proc. U. S. Natl. Mus.*, vol. 92, pp. 167-175, pls. 18-19.
- BOYLE, W. W.
 1956. A revision of the Erotylidae of America North of Mexico (Coleoptera). *Bull. Amer. Mus. Nat. Hist.*, vol. 110, pp. 65-172, figs. 1-141.
- BRITTON, E. B.
 1957. A revision of the Australian chafers (Coleoptera: Scarabaeidae: Melolonthinae). London, vol. 1, pp. 1-185, figs. 1-25, pls. 1-42.
- BROWN, W. L., JR., AND E. O. WILSON
 1956. Character displacement. *Syst. Zool.*, vol. 5, pp. 49-64, figs. 1-6.
- BURMEISTER, H.
 1855. *Handbuch der Entomologie*. Berlin, vol. 4, pt. 2, pp. 1-569.
- CASEY, T. L.
 1884-1885. Contributions to the descriptive and systematic coleopterology of North America. Philadelphia, pt. 2, pp. 61-198.
- CAZIER, M. A.
 1940a. New American *Diplotaxis* (Coleoptera—Scarabaeidae). *Great Basin Nat.*, vol. 1, pp. 127-137.
 1940b. A new *Diplotaxis* and a new synonym (Coleoptera: Scarabaeidae). *Ent. News*, vol. 51, pp. 251-252.
 1952. New West Indian Scarabaeidae and Cerambycidae (Coleoptera). *Amer. Mus. Novitates*, no. 1566, pp. 1-4, fig. 1.
- DALLA TORRE, K. W. VON
 1912. Scarabaeidae: Melolonthinae 1. *In* Junk, W., *Coleopterorum catalogus*. Berlin, vol. 20, pp. 3-290.
- DARLINGTON, P. J., JR.
 1936. Variation and atrophy of flying wings of some carabid beetles (Coleoptera). *Ann. Ent. Soc. Amer.*, vol. 29, pp. 136-179, pls. 1-3.
- FALL, H. C.
 1909. Revision of the species of *Diplotaxis* of the United States. *Trans. Amer. Ent. Soc.*, vol. 35, pp. 1-97, pl. 1.
 1932. New North American Scarabaeidae, with remarks on known species. *Jour. New York Ent. Soc.*, vol. 40, pp. 183-204.
- GERMAR, E. F.
 1824. *Insectorum species novae*. Halle, vol. 1, pp. 1-624.
- GODMAN, F. D.
 1915. *Biologia Centrali-Americana*, introductory volume. London, pp. 1-149, figs. 1-8.
- GOLDMAN, E. A., AND R. T. MOORE
 1945. The biotic provinces of Mexico. *Jour. Mammal.*, vol. 26, pp. 347-360, fig. 1.
- GUÉRIN-MÉNEVILLE, F. E.
 1830. Crustacés, arachnides et insectes. *In* Duperrey, L. J., *Voyage autour du monde . . . sur . . . la Coquille . . . zoologie*. Paris, vol. 2, pt. 2, pp. 1-319.
- GUTIERREZ, R.
 1949. Notas sobre Scarabaeidae neotropicos. *An. Soc. Cient. Argentina*, vol. 148, pp. 9-35.
 1951. El genero *Liogenys* en Chile (Coleoptera, Scarabaeidae). *Rev. Chilena Ent.*, vol. 1, pp. 129-145, figs. 1-8.
 1952. Notas sobre Scarabaeidae neotropicos. III (Coleoptera). *Ibid.*, vol. 2, pp. 207-227, fig. 1.

- HORN, G. H.
1894. The Coleoptera of Baja California. Proc. California Acad. Sci., ser. 2, vol. 4, pp. 302-449, pls. 7, 8.
- KIRBY, W.
1818. A century of insects, including several new genera. Trans. Linnean Soc. London, vol. 12, pp. 375-482, pls. 21-23.
1837. The insects. In Richardson, J., Fauna Boreali-Americana. Norwich, vol. 4, pp. 1-325.
- LACORDAIRE, T.
1856. Histoire naturelle des insectes. Paris, vol. 3, pp. 1-594.
- LECONTE, J. L.
1856. Synopsis of the Melolonthidae of the United States. Jour. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, pp. 225-288.
1859. The Coleoptera of Kansas and eastern New Mexico. Smithsonian Contrib. Knowledge, vol. 11, art. 6, pp. 1-58, pls. 1-2.
1863. New species of North American Coleoptera. Smithsonian Misc. Coll., no. 167, vol. 6, pp. 1-177.
- LENG, C. W.
1920. Catalogue of the Coleoptera of America, north of Mexico. Melolonthini. Mt. Vernon, New York, pp. 254-257.
- LINELL, M. L.
1896a. New species of North American Coleoptera of the family Scarabaeidae. Proc. U. S. Natl. Mus., vol. 18, pp. 721-731.
1896b. Descriptions of new species of North American Coleoptera in the families Cerambycidae and Scarabaeidae. *Ibid.*, vol. 19, pp. 393-401.
1873. Synonymical remarks upon North American Coleoptera. Proc. Acad. Nat. Sci. Philadelphia, vol. 25, pp. 321-336.
- LUGNBILL, P., AND H. R. PAINTER
1953. May beetles of the United States and Canada. U. S. Dept. Agric., tech. bull. no. 1060, pp. 1-102, figs. 1-91, pls. 1-78.
- MOSER, J.
1912. Bemerkungen zu einigen Nonfriedschen Arten (Col.). Deutsche Ent. Zeitschr., p. 325.
1918. Beitrag zur Kenntnis der Melolonthiden (Col.) VIII. Stettiner Ent. Zeitg., vol. 79, pp. 297-349.
1921. Neue Melolonthiden von Mittel- und Sud-Amerika. *Ibid.*, vol. 82, pp. 133-182.
- NONFRIED, A. F.
1894. Beschreibungen neuer Lamellicornier, Buprestiden und Cerambyciden aus Central- und Sud-Amerika. Ent. Nachr., vol. 20, pp. 113-128.
- SAY, T. L.
1825. Descriptions of new species of coleopterous insects inhabiting the United States. Jour. Acad. Nat. Sci. Philadelphia, vol. 5, pp. 160-204.
- SAYLOR, L. W.
1942. Miscellaneous notes on some exotic Melolonthinae. Proc. U. S. Natl. Mus., vol. 92, pp. 162-165.
- SCHAEFFER, C.
1907. New Scarabaeidae. Jour. New York Ent. Soc., vol. 15, pp. 60-75.
- SMITH, H.
1941. Las provincias bioticas de Mexico, segun la distribucion geografica de las lagartijas del genero *Sceloporus*. An. Escuela Nac. Cienc. Biol., Mexico, vol. 2, pp. 95-110.
1949. Herpetogeny in Mexico and Guatemala. Ann. Assoc. Amer. Geogr., vol. 39, pp. 219-238, fig. 1.
- SORRE, M.
1928. Mexique, Amérique centrale. In Vidal de la Blache, P., and L. Gallois, Géographie universelle. Paris, vol. 14, pp. 1-234, figs. 1-48, pls. 1-48.
- STANDLEY, P. C.
1924. Trees and shrubs of Mexico. Contributions from the U. S. Natl. Herbarium. Washington, vol. 23, pts. 4-5, pp. 849-1721.
- TUXEN, S. L.
1956. Taxonomist's glossary of genitalia in insects. Copenhagen, 283 pp., 215 figs.
- VAURIE, P.
1954. New synonymy in *Diplotaxis* (Coleoptera, Scarabaeidae). Bull. Brooklyn Ent. Soc., vol. 49, pp. 49-54.
1956. *Diplotaxis* of the eastern United States, with a new species and other notes (Coleoptera, Scarabaeidae). Coleop. Bull., vol. 10, pp. 1-9, figs. 1-7.
- VAURIE, P., AND M. A. CAZIER
1955. Thirteen new species of *Diplotaxis* from northern Mexico. Amer. Mus. Novitates, no. 1739, pp. 1-25, figs. 1-3.
- WOOD, S. L.
1952. Observations on the homologies of the copulatory apparatus in male Coleoptera. Ann. Ent. Soc. Amer., vol. 45, pp. 613-617, pls. 1-2.

INDEX OF SCIENTIFIC NAMES

Page numbers refer to the main references. Synonyms as well as valid names are listed.

- abnormis, 374
aenea, 288
aereomicans, 362
albasetosa, 289
Alobus, 282
alutacea, 360
anxius, 323
Apogonia, 272
arizonica, 356
aulacochela, 319
aurata, 358
bowditchi, 301
brevidens, 325
brevipilosa, 305
carbonaria, 385
carinata, 373
carinifrons, 361
cavifrons, 347
cephalotes, 366
Clemora, 272
clypeata, 289
Cnemarachis, 272
contracta, 375
coriacea, 348
corrosa, 287
costanera, 351
cribratella, 372
cribulosa, 329, 331
crinigera, 346
Diazus, 282
Diplotaxis, 282
ebenina, 389
ennea, 373
fissilabris, 318
flavisetis, 280
fossifrons, 365
fossilpalpa, 327
guatemalica, 334
hallei, 291
hebes, 371
hirsuta, 341
illustris, 326
indigena, 381
jacala, 308
jamaicensis, 362
knausii, 315
laeviscutata, 325
Liogenys, 272
maya, 310
Melolontha, 270
metallescens, 364
mexicana, 298
microtichia, 305
mima, 372
mimosae, 333
moerens, 320, 322
mus, 376
nitidicollis, 387
obregon, 332
ohausi, 313
Orsonyx, 282
Pachrodema, 272
pachucana, 287
Pacuvia, 272
pauperata, 288
peninsularis, 323
Phyllophaga, 272
pilifera, 293
pilipennis, 350
popino, 331
poropyge, 343
Pseudodiplotaxis, 272
puberea, 304
puberula, 339
pubipes, 309
puncticollis, 344
rex, 378
rita, 368
rockefelleri, 381
rudis, 379
rugosifrons, 333
rugosoides, 385
rugosipennis, 388
selanderi, 354
sericeiventris, 371
simillima, 306
simplex, 366
sinaloa, 331
sinuaticeps, 366
sordida, 385
spina, 307
subrugata, 340
subrugosa, 343
tarascana, 352
tarsalis, 298
Triodonyx, 272
vandykei, 382
villosa, 339
villosipes, 327
wittkugeli, 280
zapoteca, 355
zeteki, 311

