

REVISION OF THE SPECIES OF BEETLES OF THE GENUS TRIRHABDA NORTH OF MEXICO

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INTRODUCTION

The genus *Trirhabda* of the Chrysomelidae was described by LeConte¹ in 1865, and to it were assigned nine North American species, all of which are still commonly retained in the genus. They are, in order: *T. nitidicollis*, new species, *T. (Galleruca) canadensis* Kirby, *T. (Galleruca) luteocincta* LeConte, *T. (Galleruca) flavo-imbata* Mannerheim, *T. (Galleruca) attenuata* Say, *T. convergens*, new species, *T. (Chrysomela) tomentosa* Linnaeus, *T. virgata*, new species, and *T. brevicollis*, new species. No type has hitherto been designated for *Trirhabda*. In a discussion of the typification of *Trirhabda* and some related genera contributed by H. S. Barber to the present paper (pp. 2-3), the first species, *nitidicollis*, is selected as the type of LeConte's genus. LeConte's ninth and last species, *brevicollis*, differs from the others in many characters and is made, on page 32 of this paper, the type of a new genus.

LeConte characterized the genus as having the body large, elongate, not very convex, finely punctured, and pubescent; the head not at all carinate in front, the antennae with the third joint shorter than the fourth; the prothorax with a transverse impression; the elytra margined, with epipleura extending only halfway; the tibiae not sulcate; and the claws cleft. The usual color he described as pale, with a black occipital spot on the head, three discoidal spots on the prothorax, and broad sutural and discoidal black or green stripes on the elytra, these vittae coalescing in some species and leaving only the margin pale. He separated the genus from *Galerucella* and *Monoxia* by a difference in the proportion of the

¹ Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 219, 1865. The exact date of publication of the number (for "October") in which LeConte's paper appeared is not known. The only available information is given in the note in the Index of the Contents of the Journal and Proceedings of the Academy, 1913: Vol. 17 (1865), no. 4 (pp. 173-236). "Receipt acknowledged by Albany Institute, Dec. 26, 1865."

third and fourth antennal joints—in the two latter genera the third joint is longer than the fourth—and by the short epipleura.

In the country north of Mexico there are few genera besides *Galerucella* and *Monoxia* likely to be confused with *Trirhabda*, but a few species of two closely related and mainly Central American genera have been found in the United States and described as species of *Trirhabda*. The species of these genera occurring in the United States are therefore included in this paper.

The only genus so closely related to *Trirhabda* as to be doubtfully distinct is the Central American *Nestinus*, described by the Rev. H. Clark,² also in 1865. Jacoby³ found little to distinguish the two genera except the larger size of the species of *Nestinus*. It is evident, however, that in working up the diverse Central American material he referred to *Trirhabda* species belonging to other genera. The genus *Trirhabda* as outlined by LeConte is a homogeneous group, and *Nestinus* does not conform with it either in its larger size and very coarse sculpture or in its nonvittate elytral markings. In all the species of *Nestinus* thus far described there is no suggestion of vittation, a primary characteristic of *Trirhabda*. The aedeagus in *Nestinus* resembles in general shape that of *Trirhabda* but differs from it in lacking the thinly chitinized groove that in *Trirhabda* extends medially along the dorsal surface the greater part of its length.

H. S. Barber, who has long been interested in the problems of nomenclature involved in this group, has kindly prepared the following statement designating the genotypes of *Trirhabda* and a number of related genera:

Generic concepts of authors not being in agreement and objectionable changes in the application of names being possible, the following list of generic names with genotype designations may be useful; species of *Trirhabda* have been treated under all except *Pyrrhalta*, which was wrongly included in *Trirhabda* by Crotch, 1873:

Chrysomela Linnaeus, 1758, 78 species.

Genotype, *Chrysomela populi* Linnaeus, 1758, designated by Latreille, 1810.

Cryptocephalus Geoffroy, 1762, 12 species without available names except the first and third, under which references to Linnaean species are given. The first species, now *Aegialastica alni*, was doubtless the best representative of the genus from the author's standpoint, but the genotype designation by Latreille, 1810, for the Fabrician genus *Cryptocephalus* can be and is hereby applied to the Geoffroyan genus by tracing back the citations under *sericeus* by Fabricius and Linnaeus to the species cited by Geoffroy from the prebinomial Fauna Suecica.

Genotype, *Chrysomela sericea* Linnaeus, 1758, designated by Latreille, 1810.

² Ann. and Mag. Nat. Hist., ser. 3, vol. 16, pp. 324, 325, Oct., 1865. The publishers of the Annals and Magazine of Natural History write, "To our knowledge it has always been published on the first day of the month."

³ Biol. Centr. Amer. Coleopt., vol. 6, pt. 1, pp. 483, 485, Dec., 1886.

Galeruca Geoffroy, 1762, 5 species without names, but the first one with citation to the species chosen by Latreille.

Genotype, *Chrysomela lanaceti* Linnaeus, 1758, designated by Latreille, 1810.

Galleruca Fabricius, 1792 (emendation of *Galeruca*).

Coelomera Chevrolat, in Dejean, 1837, 31 species, most of them with invalid specific names. The species chosen for type of this genus as described by Chevrolat, 1844, is acceptable for its earlier establishment in the Dejean Catalogue.

Genotype *Chrysomela cayennensis* Fabricius, 1789, designated by Weise, 1924.

Monocesta Clark, 1865 (October 1), 24 species.

Genotype, *Monocesta imperialis* Clark, 1865, designated by Weise, 1924.

Coraia Clark, 1865 (October 1), 1 species.

Genotype, *Coraia maculicollis* Clark, 1865, monobasic.

Nestinus Clark, 1865 (October 1), 3 species.

Genotype, *Nestinus bimaculatus* Clark, 1865, present designation.

Trirhabda LeConte, 1865 (October ?), 9 species.

Genotype, *Trirhabda nitidicollis* LeConte, 1865, present designation.

Pyrrhalta Joannis, 1866, 1 (?) species.

Genotype, *Galleruca viburni* Payk, 1778, monobasic (?).

Trihabda Crotch, 1873 (typographical error).

Trirhabda Gemminger and Harold, 1876 (emendation or typographical error).

DESCRIPTION OF THE GENUS

The head in *Trirhabda* is punctate and pubescent on the occiput and vertex. The occipital spot is sometimes only a narrow darkened line down the vertical fovea that is present in all species, or it may cover the entire base of the head and partly encircle the eyes. Yet in all species except two⁴ that have been hitherto placed in *Trirhabda*, this occipital spot is present, and its shape, size, and color are of considerable specific importance. The antennal joints are variable, with the fourth always longer than the third. The third and fifth antennal joints are usually not equal, although in a given species they may vary slightly.

The prothorax in most species appears transversely depressed, but this may be due to the collapse of soft tissues. It is usually approximately twice as broad as long, sometimes less, rarely more. The margin as viewed from above is usually arcuate, but may be distinctly angulate medially. The apical and the basal angles have a tiny nodule. The surface is usually either alutaceous or shining with scattered coarse punctures, rarely impunctate; sometimes it is pubescent. It is pale yellow or brown and always has three spots varying in size, color, and shape, two lateral and one median.

The color of the scutellum is an important character also. In species in which the pale color predominates, the scutellum is often bicolored.

⁴ *T. brevicollis* and *T. ornata*—here referred to a new genus; see pp. 33, 34.

The elytra are subparallel, with a narrow margin, and are confusedly punctate, the sculpture varying from very finely to rather coarsely rugose, and, except in one or two species, they are always more or less pubescent. In markings the species may be superficially divided into three classes—the vittate; the unicolorous, except for the pale margin; and the pale-brown desert species, in which the only traces of vittation are variable shoulder streaks and darkened sutural margins. The most common and typical pattern, as denoted by the generic name, is the trivittate form, with common sutural vitta and two lateral vittae always found in *canadensis* and *nitidicollis*. When the vittae begin to coalesce, there are specimens with traces of a median vitta, such as occurs commonly in *diducta* and *geminata* and occasionally even in *lewisii* and *confusa*. When the median pale area is reduced still more, such examples occur as the vittate *convergens*, *neoscotiae*, and many specimens of *lewisii*. A still further development of the dark vittae results in reducing the pale median area to a degree that is typical of such species as *bacharidis*, *attenuata*, and *pilosa*. Then come the species with the elytra entirely dark except for the margin. But in each species, with few exceptions, a varying degree of vittation is found. For instance, both vittate and entirely dark specimens may be found in *convergens*, *luteocincta*, *confusa*, and *sericotrachyla*. In the other direction, there are the pale, faded-out, arid-country forms with only remnants of vittae, such as *nigrohumeralis* and *eriodictyonis*. The best illustration of variation within a species among these is *geminata*, which ordinarily has lateral, sutural, and an abbreviated median vitta, but may have only a lateral and sutural vitta (in one specimen in the collection of the University of Kansas), or may lack all trace of vittation except for a darkened humeral spot, or, again, the elytra may be nearly piceous. In fact, *canadensis* and *nitidicollis* are exceptional in not having various degrees of coalescence in their vittate markings. The elytra as a whole are pale brown or yellow, with piceous, black, metallic-blue, green, violet, or deep indigo markings. The species occurring east of the Mississippi River (with the exception of *neoscotiae*, in which the vittae appear almost black in some lights but are really deep blue or green) all have piceous markings without metallic luster. A few are very shining and brilliant, but the majority, because of the pubescence and alutaceous surface, are duller. The dried museum specimens, for the most part, are drab and collapsed, but the fresh specimens are beautifully colored. The original color as well as the shape in this genus is best preserved by putting the fresh specimens in formalin for a few days.

The body beneath is pale, often with darker margins and sometimes with entirely dark metasternum and abdomen, frequently with a metallic luster. The legs are usually pale, but in some species

the outer sides are darkened. The principal leg characters differentiating *Trirhabda* as a genus are (1) the first tarsal joint longer than the following joints, (2) the absence of a well-marked external sulcus in the tibia, and (3) the bifid claws.

The size and shape of the aedeagus furnish good specific characters, which may well be used also to indicate generic boundaries. As it is extremely difficult to interpret descriptions of the shape of the aedeagus, I have in all species made a drawing of the dorsal view showing the shape of the tip, which varies greatly in length and shape—in some it is short and blunt, in others long and tapering; in some pointed, in others rounded; but in all the species the aedeagus is long and narrow and with a more or less acute, never truncate tip. In the *convergens* group the aedeagus varies but little. It may be that the whole group is a single species that has become separated into races in its wide geographic range, and these races have become quite different in coloring and markings. I am unable to inflate the internal sac of the aedeagus and do not know if even that would be of value in determining the species. In the *luteocincta* group the aedeagus is peculiar in its long tapering tip. Under *luteocincta* have been grouped two other species whose differences no one had suspected, but dissection revealed aedeagi so unlike that I at once began to hunt for and find external characters. The same was true of *canadensis* and *adela*, *attenuata* and *pilosa*, *virgata* and *borealis*.

The quite different structure of the aedeagus of *T. brevicollis* first led me to suspect that it might belong to a different genus. Later the dissection of a Mexican *Monocesta* brought to light the same sort of aedeagus. This *Monocesta* is closely related to if not identical with Schaeffer's *Trirhabda ornata*, of which I have seen only a single specimen, the type. *T. ornata* without doubt would have a similar aedeagus. Besides having a different aedeagus from *Trirhabda*, these three species have a differently shaped prothorax and are further distinguished by minor details of coloring and pubescence, and are herein described (p. 32) as a new genus. In addition to figures of the aedeagi of all the species of *Trirhabda*, I have given drawings of those of one or more species of each of the three closely allied genera, species of which have been ascribed to *Trirhabda*.

EGGS AND LARVAL HABITS

The life history of one of the most widespread species of *Trirhabda*, *T. canadensis*, an account of which by W. V. Balduf has been published,⁵ is probably typical of the genus. The eggs, laid on the ground, are in clusters glued together by some strong adhesive and

⁵ Ent. News, vol. 40, no. 2, pp. 35-39, 1929.

are thick shelled and tough. The genus is peculiar in that it passes the winter in the egg stage rather than the adult, as is usually the case in the Chrysomelidae. The fragile, thin integument of the adult is ill fitted to weather the snows of winter or the parching droughts of arid regions, particularly in the northern climates, which *Trirhabda* as a rule inhabits.

Although the larvae of *T. canadensis* are conspicuous in their glistening blackness on the tops of goldenrod, they do not compare with the brilliant metallic-lustrous larvae of *T. bacharidis* or of some of the western species. A detailed description of the larva of *canadensis* and notes on other species are given in Dr. Adam G. Boving's paper on Beetle Larvae of the Subfamily Galerucinae.⁶

The larvae go into the ground just below the surface, where they form cases in which to pupate. The pupal stage lasts a week or two, evidently depending somewhat on climatic conditions. The height of the season of adults is late in June or in July in the latitudes of Washington, D. C., and Los Angeles and San Francisco, Calif. In Massachusetts, adults of *virgata* occur in numbers in August, and in the Yellowstone National Park I took adults of three species, two in abundance, early in September. Early in June at the Grand Canyon, Ariz., I found nearly mature larvae of another species. One generation a year is apparently the rule.

As far as known, the larvae remain feeding on the tender foliage of their food plant. In *T. brevicollis*, in this paper referred to another genus (see p. 33), a different habit is recorded by J. D. Mitchell, who writes, "The larvae burrow into the ground where it is slightly raised, making runs or galleries, from which they crawl out and about day and night, but never more than a few inches from the colony home."⁷

GEOGRAPHIC DISTRIBUTION AND VARIATION

The genus as a whole belongs to the Transition and Boreal Zones. In most species the food plant is a composite, particularly goldenrod (*Solidago*) in the East and sagebrush (*Artemisia*) in the arid country of the West. The eastern species are few and not very variable in markings. Of the six species known to occur in the Eastern States, *canadensis*, *bacharidis*, and *virgata* are most common. Both *canadensis* and *virgata* feed on goldenrod, and occur from Canada southward, but are increasingly scarce south of New Jersey. *T. bacharidis* feeds on the salt-marsh composite *Baccharis*, which occurs on the coast all the way from southeastern Massachusetts to the Gulf of Mexico. *T. canadensis* and *T. virgata* extend across the northern

⁶ Proc. U. S. Nat. Mus., vol. 75, art. 2, pp. 1-48, 1929.

⁷ Chittenden, F. H., U. S. Dept. Agr., Div. Ent. Bull. 38, n. s., p. 103, 1902.

part of the United States and southern Canada, *canadensis* reaching the Pacific coast, although *virgata* is not found beyond the Great Plains.

A small group of three boreal species, the *convergens* group, all occurring on goldenrod, is found (1) in Nova Scotia, (2) along the shores of Lake Superior in Ontario and Wisconsin, to Manitoba and Alberta, and (3) in Alberta and in the Rocky Mountains southward to New Mexico. These species are all closely related and may be merely geographic varieties of one northern species. They are all small (the smallest of the genus) and similar in sculpture and pubescence, all have darkened ventral surface and heavy occipital and pronotal markings, and all have similar aedeagi. They differ chiefly in elytral coloring and present little intergradation in their separate localities. The Nova Scotia species is as readily separable from the Lake Superior species as both are from the Alberta and Rocky Mountain species. Moreover, the Lake Superior species has been found in Alberta preserving its distinctive coloration. Because they are so readily separated, I have given names to each form, although structurally there is little to distinguish them. Another northern species, *borealis*, extends from Massachusetts through Michigan and the Dakotas to Montana and Washington, but is recorded south of these States only from West Virginia, where it probably was found in the mountains, and from Kansas and Missouri. Four species are almost confined to the area from the Great Plains west through the Rocky Mountains. *T. lewisii* is restricted to the Rocky Mountain region and lives on *Chrysothamnus*. *T. nitidicollis*, also found on *Chrysothamnus*, occurs from Wyoming to Arizona and New Mexico and into the arid southern part of California. It presents many color variations, although the pattern of the markings is quite uniform throughout its range. *T. attenuata* feeds on both goldenrod and sagebrush, and has a range from the Great Plains (Kansas and Nebraska) to Alberta and through the northern Rocky Mountain region in the United States. *T. pilosa* extends from Wyoming and Nevada into the Sierra Nevada in California.

On the Pacific coast the species of *Trirhabda* are manifold, with extremely variable markings, and present most interesting relationships. *T. luteocincta* occurs on the southern coast of California on a species of *Aplopappus*, and *T. labrata*, its close relative, is found about Monterey on *Aplopappus ericoides*. Another closely related species, *confusa*, said to be a sagebrush feeder, is found chiefly inland, and still another, *sericotrachyla*, which has hitherto been confused with *luteocincta*, appears to be found only along the coast from San Diego to Los Angeles. *T. flavolimbata*, which feeds on *Baccharis pilularis*, has been collected only in the San Francisco region.

Among the arid-region forms is *eriodictyonis*, known chiefly from the Mojave Desert region and found on a species of *Eriodictyon* (Hydrophyllaceae). One other California species, *diducta*, also feeds on *Eriodictyon*, but occurs as far north as San Francisco. These two species breeding on *Eriodictyon* are so closely related that one is almost tempted to call them varieties of the same species. *T. diducta* ranges southward and inland to Nevada, and specimens from around Fresno are difficult to separate in general appearance from *eriodictyonis*. Another very distinct species, *caduca*, described by Horn, has not been found outside Owens Valley. Two other species, *geminata* and *nigrohumeralis*, with the pale-brown coloring typical of forms from arid regions, occur in New Mexico and Arizona, and *geminata* extends to the Pacific coast through southern California, but specimens collected there usually have much darker, almost piceous, elytra.

T. brevicollis, not a true *Trirhabda*, feeds on prickly-ash (*Zanthoxylum*) and occasionally is a pest on orange, both belonging to the Rutaceae. It is found in the Gulf States and north in the Middle States even to Michigan. *T. ornata*, also referred to the same genus, is found only in Texas, and *T. (=Coraila) subcyanescens* has been recorded only from the southern tip of Texas in Cameron and Hidalgo Counties.

Without a fully representative collection, it is extremely difficult to identify specimens of *Trirhabda*. The genus is homogeneous, possessing few structural characters by which to separate the species; the species are with few exceptions variable in elytral markings and coloring, and as a rule they can not be determined by their food plant, since the majority feed on goldenrod or sagebrush or both. The key here given will probably not prove satisfactory to those who are not somewhat familiar with the group. In species that are similar in external appearance, the shape of the aedeagi is of great help in the identification.

In designating paratypes of the new species, I have taken care to list only other specimens bearing the same data as the type, although in all cases a larger number of specimens of the species was at hand. This is not generally the practice in entomology at present, but in the case of a genus in which the species are so closely related and so easily confused, it is desirable that the paratypes should be as nearly as possible equivalent to the type.

I have been fortunate in having many collections placed at my disposal, and wish to thank the following men for their kindness in sending me their own collections or those in their care: Nathan Banks and P. J. Darlington, of the Museum of Comparative Zoology, Cambridge, Mass.; C. W. Johnson, of the Boston Society of Natural

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KEY TO GENERA

1. Third and fourth antennal joints approximately equal or third slightly the longer; a distinct ridge or sulcus on outer edge of tibia extending its entire length..... 2
 Third antennal joint distinctly shorter than fourth; sulcus on outer edge of tibia indistinct, not extending its entire length..... 3
2. Body dilated posteriorly; prothorax more than twice as broad as long, with arcuate sides; antennae not longer in male..... *Monocesta*
 Body parallel; prothorax subquadrate, scarcely twice as broad as long, sides tending to be straight or slightly angulate at middle; antennae longer and more robust in male..... *Coraia*
3. Aedeagus short, truncate; prothorax considerably more than twice as broad as long; head glabrous..... *Derospidea*, new genus
 Aedeagus long, acute at tip; prothorax approximately twice as broad as long; head pubescent..... *Trirhabda*

KEY TO THE SPECIES OF TRIRHABDA

1. Occipital and pronotal spots and elytral vittae piceous or black without metallic luster..... 2
 Occipital or pronotal spots or vittae or entire elytra except for margin dark with metallic luster..... 12
 Occipital and pronotal spots and remnants of elytral vittae reddish brown to piceous. Species of the arid Southwest..... 29
2. Pronotal surface between coarse punctures smooth and shining..... 3
 Pronotal surface between coarse punctures alutaceous..... 4
3. Elytra coarsely punctate, with short, very sparse pubescence; sutural vitta only a narrow darker border of sutural edges, lateral vitta narrow, more or less evanescent; pronotum usually coarsely punctate, not polished. Owens Valley, Calif..... *caduca* (p. 31)
 Elytra finely punctate, finely and densely pubescent; sutural and lateral vittae usually united at apex; pronotum sparsely punctate, polished. Rocky Mountains and southern California..... *nitidicollis* (p. 23)
4. Elytra with lateral and sutural vittae united before or slightly behind middle or with traces of median vitta coalescing with lateral vitta..... 5
 Elytra with lateral and sutural vittae distinct and not united before apex, no median vitta..... 7

5. Large (7 mm. to 12 mm.); elytra finely and densely pubescent; vittae coalescing shortly behind middle. Atlantic seacoast on *Baccharis*..... *baccharidis* (p. 12)
Smaller (5 mm. to 9 mm.); elytra not densely pubescent; usually on *Solidago* or other dry-land composite..... 6
6. Lateral and sutural elytral vittae usually distinct, with traces of median vitta, sometimes coalescing, sometimes evanescent; pronotum densely and coarsely punctate. Southwestern United States..... *geminata* (p. 31)
Lateral and sutural vittae united behind middle; pronotum with scattered coarse punctures. Southeastern United States.
virgata var. (p. 16)
7. Occipital spot small, oblong, not forming a transverse basal band or extending broadly down front; elytra densely pubescent, finely punctate..... *canadensis* (p. 13)
Occipital spot either a wide transverse basal band or extending broadly down front..... 8
8. Elytral vittae on close examination deep blue or green, although appearing black; body beneath mostly dark. Nova Scotia.
neoscotiae, new species (p. 17)
Elytral vittae always entirely piceous or black; body beneath usually pale, often with a narrow dark margin, this occasionally widening..... 9
9. Scutellum usually with pale tip; elytra inconspicuously pubescent, finely punctate..... *lewisii* (p. 22)
Scutellum black; elytra distinctly pubescent and, except in *adela*, distinctly and often coarsely punctate..... 10
10. Elytra densely pubescent, covering fine punctation.
adela, new species (p. 14)
Elytra not densely pubescent, the coarse sculpture apparent..... 11
11. Robust (6 mm. to 9 mm.), coarsely punctate; occipital spot usually widely oblong and extending down front; aedeagus broad with short tip (see pl. 1, fig. 4)..... *virgata* (p. 15)
Slenderer (5.5 mm. to 8 mm.), not so coarsely punctate; occipital spot a transverse basal band curving down front; aedeagus gradually narrowed at tip (see pl. 1, fig. 5).
borealis, new species (p. 16)
12. Pronotum conspicuously pubescent..... 13
Pronotum either entirely glabrous or very inconspicuously and sparsely pubescent..... 15
13. Abdomen entirely dark except for last segment; elytra green except for pale margin and small basal vitta not reaching middle, smaller (4.5 mm. to 6.8 mm.)..... *pilosa*, new species (p. 20)
Abdomen never entirely dark, usually pale with narrow darker margin; elytra except for pale margin entirely blue or green, or with lateral, sutural, and traces of median vittae; larger (5 mm. to 8 mm.)..... 14
14. Pronotal spots large; pronotum coarsely and densely punctate.
California..... *sericotrachyla*, new species (p. 28)
Pronotal spots small; pronotum not densely punctate. Rocky Mountains and Great Plains..... *attenuata* (p. 21)
15. Pronotum not alutaceous, more or less shining..... 16
Pronotum distinctly alutaceous..... 24

16. Pronotal spots entirely without metallic luster, usually small or moderate sized..... 17
 Pronotal spots with metallic luster, usually large..... 21
17. Sutural vitta entirely absent or at most represented only by darkened sutural edges, lateral vitta often reduced to an elongate humeral spot. Southern California..... *eriodietyonis* (p. 24)
 Lateral and sutural vittae well marked, sometimes a median vitta, sometimes elytra entirely dark except for pale margin..... 18
18. Pronotum very smooth, not depressed, polished; spots usually small; elytra never with median vitta or entirely dark..... *nitidicollis* (p. 23)
 Pronotum somewhat depressed, not so shining; spots usually moderate-sized; elytra either with median vitta or entirely dark except for margin..... 19
19. Elytra with long, dense, silky pubescence covering the punctation, sometimes entirely blue or green except for margin, sometimes vittate with median vitta..... *confusa*, new species (p. 27)
 Elytra with sparser, shorter pubescence, the punctation distinctly visible..... 20
20. Occipital spot black, narrowly oblong down front; elytra usually with short median vitta, never entirely dark, punctation fine..... *diducta* (p. 25)
 Occipital spot with metallic luster, curving broadly over head, often forming transverse basal band; elytra entirely blue or green except for margin and rather coarsely punctate.
flavolimbata (p. 29)
21. Very brilliantly metallic, with broad shining blue or green occipital basal band, and large, often contingent, lustrous pronotal spots; elytra inconspicuously pubescent and coarsely punctate, shining blue or green except for margin..... *labrata* (p. 28)
 Metallic luster more or less obscured by pubescence, the occipital band and pronotal spots not so lustrous nor usually so large; elytra distinctly pubescent and with finer punctation..... 22
22. Oblong oval, elytra rather coarsely punctate, never vittate, pubescence not long and silky (5 mm. to 8 mm.). About San Francisco..... *flavolimbata* (p. 29)
 Parallel (7 mm. to 10.5 mm.); elytra with long silky pubescence, sometimes vittate. Southern California and inland..... 23
23. Large (8.5 mm. to 10.5 mm.); abdomen mostly dark with metallic luster, prothorax much depressed, its large spots with distinct metallic luster. Along seacoast, southern California.
luteocincta (p. 26)
 Smaller (7 mm. to 8.5 mm.); abdomen pale, sometimes with margin dark metallic; prothorax with smaller spots with indistinct metallic luster. Along seacoast, southern California and inland, extending to Oregon line... *confusa*, new species (p. 27)
24. Elytra finely and inconspicuously punctate; body beneath never entirely dark; scutellum often with pale tip..... 25
 Elytra rather coarsely punctate; body beneath usually more or less darkened (not in *borealis* var. *indigopectera*); scutellum always dark..... 26
25. Elytra inconspicuously pubescent; pronotal spots moderately large; lateral and sutural vittae usually distinct and united at apex, occasionally coalescing before apex..... *lewisii* (p. 22)

- Elytra with fine, white pubescence; pronotal spots small, median one situated nearer base of pronotum than anterior margin; lateral and sutural vittae usually coalescing behind middle, rarely the attenuated median pale vitta extending much below middle..... *attenuata* (p. 21)
26. Large (6 mm. to 8 mm.); elytral vittae very dark, appearing black, but with indistinct blue, purple, or, rarely, green hue; abdomen mostly pale..... *borealis indigoptera*, new variety (p. 17)
- Smaller (5 mm. to 6.5 mm.); elytral vittae or entire elytra (in species with elytra dark except for margin) with green or blue luster, more or less pronounced; abdomen always dark..... 27
27. Elytral vittae inconspicuously green or blue, appearing nearly black. Nova Scotia..... *neoscotiae*, new species (p. 17)
- Elytral vittae or entire elytra except for margin with distinct metallic luster. Great Lakes westward..... 28
28. Elytra usually entirely blue or green, the vittae in vittate forms usually not united at apex; elytra only moderately pubescent; body beneath dark without metallic luster, paler in vittate forms. Great Lakes, Wisconsin, Manitoba, Alberta.
viridicyanea, new species (p. 19)
- Elytra entirely green except for margin, or in vittate forms with wide lateral and sutural vittae united at apex; elytra densely pubescent; body beneath dark with metallic luster.
Rocky Mountains..... *convergens* (p. 18)
29. Elytra coarsely punctate, very sparsely pubescent..... *caduca* (p. 31)
- Elytra not coarsely punctate, finely and densely pubescent..... 30
30. Pronotum densely and coarsely punctate; elytra usually with median vitta or traces of it, or entirely reddish brown or piceous..... *geminata* (p. 31)
- Pronotum sparsely and coarsely punctate; elytra never with median vitta or entirely dark..... 31
31. Prothorax not angulate, alutaceous; elytra with only small dark humeral spot, not with metallic luster; small (5 mm. to 7 mm.). Arizona and New Mexico..... *nigrohumeralis* (p. 30)
- Prothorax usually angulate, shining; elytra usually with elongate humeral spot, and usually with metallic luster; larger (5 mm. to 9 mm.). Southern California..... *eriodictyonis* (p. 24)

1. *TRIRHABDA BACHARIDIS* (Weber)

Plate 1, Figure 1

Galleruca bacharidis WEBER, *Observationes Entomologicae*, p. 57, 1801.—FABRICIUS, *Syst. El.*, vol. 1, p. 480, 1801.—OLIVIER, *Ent.*, vol. 6, p. 629, pl. 3, fig. 34, 1808.

Trirhabda tomentosa LECONTE, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 17, p. 220, 1865. Probably not *Galleruca tomentosa* Linnaeus, *Syst. Nat.*, ed. 12, vol. 1, pt. 2, p. 601.

Description.—Robust, subparallel, pale yellow, with darkened antennae and tarsi, black occipital and three thoracic spots, and wide lateral vitta joining with sutural vitta below middle. Head pale with dark mouth parts and occipital plaga extending narrowly down

vertex; alutaceous with dense coarse punctation over occiput, lightly pubescent. Antennae with third joint short and robust, considerably shorter than fifth. Prothorax approximately twice as broad as long; sides only slightly arcuate with small median angle; surface alutaceous with sparse, coarse punctures; pale yellow with the usual three black spots of medium size. Scutellum black. Elytra densely, shallowly, and confluent punctate and covered with short, dense, pale pubescence; sutural and wide lateral vittae usually joined after middle (in some Louisiana specimens vittae joined at middle). Body beneath pale with margins of metasternum and abdomen darkened, tarsi also dark. Length, 7.5 mm. to 12 mm.; width, 3.5 mm. to 4.5 mm.

Type locality.—Eastern North America.

Distribution.—New York (Huntington, L. I.); Maryland (Chesapeake Beach); District of Columbia (Washington); Virginia (Virginia Beach); North Carolina (Wilmington); South Carolina (Charleston and Holly Hill); Georgia; Florida (Crescent City); Louisiana (New Orleans and Baton Rouge).

Food plant.—Groundselbush, *Baccharis halimifolia* Linnaeus.

Remarks.—This species has been known as *tomentosa* Linnaeus since LeConte identified it with *Galleruca tomentosa* Linnaeus, possibly following Illiger's statement.⁸ But Linnaeus compares the size of *tomentosa* with that of *G. capreae*, the European *Lochmaea capreae*, a far smaller beetle about 5 mm. long. As this species of *Trirhabda* is one of the largest, averaging about 10 mm., it does not seem probable that Linnaeus could have had it before him in writing his description, but rather some species of *Galerucella*. Weber's description and Olivier's figure, as well as the name indicating the food plant, leave no doubt that Weber's description refers to the common coastal species of *Trirhabda* of eastern North America found on *Baccharis*.

2. TRIRHABDA CANADENSIS (Kirby)

Plate 1, Figure 2

Galleruca canadensis KIRBY, Fauna Boreali-Americana, part 4, p. 219, 1837.
Trirhabda canadensis LECONTE, Proc. Acad. Nat. Sci. Philadelphia, p. 219, 1865.
Trirhabda canadensis var. *tomentosa* CROTCH, Proc. Acad. Nat. Sci. Philadelphia, vol. 25, p. 56, 1873.

Description.—Elongate, pale yellow, with darkened antennae and tarsi and sides of abdomen, and with small black occipital and usual pronotal spots; black sutural and lateral vittae on elytra narrow and joined at apex. Head alutaceous with coarse punctures, moderately pubescent, an oblong black spot on occiput extending down front.

⁸ Mag. für Insektenkunde, vol. 6, p. 146, 1807.

Antennae with third joint shorter than fifth. Prothorax not twice as broad as long, with sides slightly arcuate, angles small, not prominent; surface alutaceous with scattered coarse punctures; spots small and black, median one tending to be diamond-shaped. Scutellum entirely black. Elytra densely but finely punctate, and covered with dense pale pubescence; lateral and sutural vittae only moderately wide and usually united at apex. Body beneath mostly pale, frequently with dark margins to metasternum and abdomen. Length, 7 mm. to 10 mm.; width, 3 mm. to 4 mm.

Type locality.—Canada. Collected by Doctor Bigsby, probably north of the Great Lakes or the St. Lawrence River.

Distribution.—Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, West Virginia, Michigan, Illinois, Kansas, Nebraska, South Dakota, Montana, Idaho, Colorado, Wyoming, Utah, Nevada, Arizona, New Mexico, California ("Siskiyou"), and Washington.

Food plant.—Goldenrod, *Solidago*.

Remarks.—This is probably the most widespread species of the genus, although its occurrence in the southern Atlantic and Gulf States has not been recorded. It is unlikely that Kirby's description applies to any other species, as there is no vittate northern *Trirhabda*, except this species, having a "dot" for an occipital spot. It varies little in markings in its wide range. The lateral and sutural vittae are usually united at the apex; the occipital and pronotal spots are small. The dense elytral pubescence and fine punctation at once distinguish it from *virgata*, while the somewhat depressed and finely alutaceous pronotum distinguishes it from *nitidicollis* with its polished, smooth pronotum.

3. TRIRHABDA ADELA, new species

Plate 1, Figure 3

Description.—Of same general appearance as *T. canadensis*, but usually with a broad black plaga extending across occiput and larger, rounded spots on pronotum; pronotum also with more arcuate sides, and elytral vittae not united. Head coarsely, rugosely punctate, moderately pubescent, with wide black plaga extending across occiput and down front. Antennae with third joint shorter than fifth. Prothorax about twice as broad as long with arcuate sides and feeble angles; alutaceous with scattered coarse punctures; spots larger and rounder than in *canadensis*. Scutellum black. Elytra a little more coarsely punctate than in *canadensis*, densely and finely pubescent; black sutural and lateral vittae moderately wide and usually not united at apex. Body beneath sometimes with abdomen entirely

dark, usually with only margin of metasternum and abdomen dark. Length, 6 mm. to 10 mm.; width, 2.8 mm. to 4.5 mm.

Type.—Collected by E. R. Kalmbach, July, August, 1912, at Bountiful, Utah. U. S. N. M. No. 43016 (with 11 paratypes).

Distribution.—"Hudson's Bay Territory," Illinois, Maryland, North Dakota, South Dakota, Kansas, Missouri, Texas, Wyoming, Montana, Utah, Nevada, California.

Food plants.—Thistle, *Cirsium* sp. (I. N. Gabrielson, North Dakota); tall goldenrod, *Solidago altissima* (J. C. Bridwell, Glen Echo, Montgomery County, Md., near Washington, D. C.).

Remarks.—This species has always been confused with *canadensis*, which it closely resembles in size and general coloring. There are structural differences, however, in the shape of the tip of the aedeagus, besides the difference in the shape of the prothorax, with its more arcuate sides. The markings are also slightly different. There is a much wider basal plaga across the head, the pronotal spots are larger and rounder, and the elytral vittae do not ordinarily unite at the apex of the elytra as in *canadensis*. The elytra, too, are a little more coarsely punctate.

It has been collected chiefly west of the Mississippi River, although a large series from Illinois is in the collection of the Illinois State Natural History Survey, and a series was taken by J. C. Bridwell in the Potomac River Valley at Glen Echo, Md.

Specimens of this species in Blanchard's collection are labeled by him as "western *canadensis*."

4. TRIRHABDA VIRGATA LeConte

Plate 1, Figure 4

Trirhabda virgata LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 220, 1865.

Description.—Oblong, robust, coarsely punctate, pale with darkened antennae, with black occipital spot, three moderately large pronotal spots, and wide piceous lateral and sutural vittae, usually not united at apex. Head alutaceous with obsolete coarse punctures; usually a wide, oblong, black occipital spot extending down front and covering base of head (shown when head is protruded); sparsely pubescent. Antennae robust, with third joint much shorter than fifth. Prothorax approximately twice as broad as long, usually obtusely angulate; surface dull and strongly alutaceous with scattered, coarse, shallow punctures; spots moderately large. Scutellum entirely black. Elytra coarsely and confluent punctate, inconspicuously and rather sparsely pubescent; lateral and sutural vittae wide, the former usually wider than inclosed pale vitta, these dark vittae

seldom uniting at apex. Body beneath with sides of metasternum and abdomen more or less darkened. Length, 6 mm. to 9 mm.; width, 2.5 mm. to 4 mm.

Type locality.—"Middle and Southern States."

Distribution.—Nova Scotia (Halifax); Ontario (?) ("Windsor"), New Hampshire (Chocorua); Massachusetts; Connecticut; Rhode Island; New York; New Jersey; Pennsylvania; Ohio; Illinois; Wisconsin; South Dakota (Brookings); Kansas; Missouri; Texas (Belfrage collection); Alabama (Tumblin Gap and Monte Sano); Georgia (Stone Mountain).

Food plant.—Goldenrod, *Solidago*.

Remarks.—The coarse, shallow punctation and sparse pubescence of the elytra at once distinguish this from the finely punctate, densely pubescent *canadensis* and *adela*, and the sparse pubescence separates it from the larger species, *bacharidis*. One specimen from Stone Mountain, Ga., collected by P. W. Fattig, and two from Alabama, collected by H. P. Löding, I have rather doubtfully placed with *virgata*. They are more slender and parallel and distinctly (not so confluent) punctate on the elytra, and are more heavily marked, the occipital spot becoming a wide basal band, and the elytral vittae joining at the apex. In the Stone Mountain specimen the vittae widen so as to coalesce shortly behind the middle, leaving only a very narrow, pale, abbreviated vitta as in *bacharidis*. All three specimens unfortunately are females.

5. TRIRHABDA BOREALIS, new species

Plate 1, Figure 5

Description.—Small, oblong, pale; head with wide black occipital band, prothorax with three black spots, elytra with wide black sutural and lateral vittae; elytra more finely punctate than in *virgata*. Head alutaceous with obsolete shallow punctation, very lightly pubescent; occipital band across base curving broadly down front, but not attaining margin of eyes. Antennae with third joint shorter than fifth, fourth long. Prothorax barely twice as broad as long, slightly arcuate, sometimes feebly obtuse-angulate; surface alutaceous with scattered coarse punctures; spots moderately large and black. Scutellum black. Elytra rather finely but confluent punctate, with short fine pubescence; lateral and sutural vittae wide and black and usually not united at apex. Body beneath pale with narrow dark margin to metasternum and abdomen, in Montana specimens this margin becoming very wide and leaving only a narrow pale median line. Length, 6 mm. to 7 mm.; width, 2 mm. to 3 mm.

Type.—Collected by H. B. Hungerford, July, 1927, at Douglas Lake, Mich. U.S.N.M. No. 43017 (with 5 paratypes). Six paratypes deposited in collection of Kansas University.

Distribution.—Massachusetts; New York (Lake Placid); West Virginia; Michigan; Minnesota; North Dakota; South Dakota; Missouri; Montana; Washington; "Fort McLeod, British America."

Food plant.—Unknown.

Remarks.—This species has been confused with *virgata* and *convergens* in collections. It is smaller, more slender, and with finer elytral punctation than *virgata*. In fact, some specimens, probably because of the fine punctation, have been labeled *canadensis*, but it is quite distinct from *canadensis* in its smaller size and heavier markings and sparser elytral pubescence. It usually differs also from both *virgata* and *canadensis* in having a wide black band across the base of the head, curving broadly down over the front. It is more closely related to *convergens*, but is not so small or with so long pubescence, and lacks metallic luster in its dark markings. The pale vittae are usually wider than in *convergens* and extend to the apex. The western specimens from the Rocky Mountain region have a darker ventral surface than the eastern ones, which are almost entirely pale beneath. The aedeagus in *borealis* is not so heavy or so long as in *virgata*, and the tip is more acutely narrowed in contrast to the broader, blunter tip of *virgata*.

TRIRHABDA BOREALIS INDIGOPTERA, new variety

Description.—Larger (6 mm. to 8 mm. long, 2.5 mm. to 3.5 mm. wide); vittae usually deep blue or purplish, rarely green. Body beneath mostly pale.

Type.—Collected at Brookings, S. Dak. (Knab collection). U. S. N. M. No. 43018 (with 14 paratypes).

Distribution.—Illinois, Minnesota, North and South Dakota, Kansas.

Remarks.—The elytral vittae are so deep blue or purplish that unless they are examined closely or compared with specimens having black vittae, the bluish hue is not readily seen. This variety is about the same size as *virgata*, with which it has been confused in collections, although it is slightly more slender and has finer elytral punctation.

6. TRIRHABDA NEOSCOTIAE, new species

Plate 1, Figure 6

Description.—Small, subparallel, not shining, pale, with wide black occipital plaga, rather large pronotal spots, and very dark blue or bluish green (appearing nearly black) wide lateral and sutural vittae; ventral surface mostly dark. Head alutaceous with obsolete coarse punctures, finely and sparsely pubescent; a wide black occipital plaga extending across base of head and curving down front, but not attaining margin of eyes. Antennae with

third joint shorter than fifth. Prothorax scarcely twice as wide as long, with arcuate sides, surface alutaceous with scattered coarse punctures; spots usually large, especially the median one, and black. Scutellum entirely dark. Elytra coarsely punctate, with punctures confluent and shallow, not so coarse and distinct as in *virgata*; finely pubescent; a wide lateral vitta frequently uniting at apex with sutural vitta, the intervening pale vitta being in many cases extremely narrow but of approximately same width throughout its length, these dark vittae blue or green (often inconspicuously so), not lustrous. Body beneath pale with sides of metasternum and abdomen widely darkened. Length, 5.6 mm. to 6.5 mm.; width, 2.5 mm. to 3.2 mm.

Type.—Collected by C. A. Frost, July, 1929, Portau-pique, Nova Scotia. U.S.N.M. No. 43019 (with 7 paratypes). Ten paratypes in collection of C. A. Frost.

Distribution.—Nova Scotia (Castlereigh, Westchester, Portau-pique).

Food plant.—Goldenrod, *Solidago*.

Remarks.—The three species of the *convergens* group—*neoscotiae*, *convergens*, and *viridicyanea*—are all closely related, although easily separable by their elytral coloring and generally by their geographic range. They may all be varieties of a small northern species. I am unable to separate them by the shape of the aedeagus, which in all is very similar. LeConte treated the first of these (*neoscotiae*) as a form of *convergens*, in which the lateral and sutural vittae frequently are not united. The Nova Scotia specimens also are unlike typical *convergens* in coloring, having dark vittae without metallic luster, and often appearing nearly black. *T. neoscotiae* is not so densely pubescent as typical *convergens*, and the sutural and lateral vittae never coalesce so as to cover the elytra except for the pale margin, as is frequently the case in typical *convergens*. The ventral surface also is not so completely darkened.

7. TRIRHABDA CONVERGENS LeConte

Plate 1, Figure 7

Trirhabda convergens LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 220, 1865.

Description.—Small, subparallel, faintly shining with metallic luster, pale with a wide dark basal plaga across head, large black pronotal spots and elytra either entirely metallic green except for margin or with narrow pale vitta, usually wider at base and not reaching apex; ventral surface dark. Head alutaceous with obsolete rugose punctation; a wide dark plaga, often with green luster, over base of head, frequently reaching margin of eyes and some-

times a dark margin encircling eyes. Antennae with third and fifth joints subequal. Prothorax approximately twice as broad as long, with arcuate sides; surface alutaceous with scattered coarse punctures; spots large and black. Scutellum black. Elytra coarsely and confluent punctate, covered with long, dense, pale pubescence, entirely metallic green except for pale margin or with a median narrow pale vitta, wider at base and usually extending well down to apex, but not joining apical pale margin (in one specimen from Custer, S. Dak., the pale vitta reaches apex). Body beneath pale with metasternum and abdomen except for last ventral segment dark with green luster. Length, 5 mm. to 6.5 mm.; width, 2.3 mm. to 3 mm.

Type locality.—"Kansas, Nova Scotia" (the Nova Scotia specimens are here referred to *T. neoscotiae*).

Distribution.—Alberta (Waghorn, Blackfalds, Edmonton); Montana (Bear Paw Mountain, Beaver Creek); Wyoming (Yellowstone Park, Rock River); Colorado (Buena Vista, Pingree Park, Pagosa Springs, Creede, Colorado Springs); New Mexico (Fort Wingate, Pecos); South Dakota (Custer); Kansas (Douglas County); Michigan (Trout Lake).

Food plant.—Goldenrod, *Solidago* (F. S. Carr).

Remarks.—Compared with *T. neoscotiae*, specimens of this species are a little smaller, the vittae are decidedly green, with more metallic luster, the plaga over the head frequently and the ventral surface nearly always have a green luster, as is not the case with *neoscotiae*, and the entire elytra, except for the margin, are frequently green. The shape of the elytral vittae is somewhat different in that the pale vitta is usually wider near the base of the elytra, converging and becoming attenuated toward the apex. The third, fourth, and fifth antennal joints are usually somewhat different in length from the corresponding ones of *neoscotiae*, in which the fourth is considerably longer and the third not subequal to fifth.

Prof. T. D. A. Cockerell has named the variety without vittae *virescens*.⁹

8. TRIRHABDA VIRIDICYANEA, new species

Plate 1, Figure 8

Description.—Small, parallel, coarsely punctate, pale with broad black occipital and pronotal spots; elytra except for margin usually bright blue green, occasionally with a pale median vitta, lightly pubescent; ventral surface more or less dark. Head alutaceous with punctures obsolete and confluent, moderately pubescent; a wide black occipital band, sometimes attaining margin of eyes, rarely

⁹ *Trirhabda convergens virescens*, Ent. News, vol. 1, p. 4, 1890.

with a faint metallic luster. Prothorax twice as broad as long, with arcuate sides, alutaceous with scattered coarse punctures; spots moderately large, black. Scutellum entirely black. Elytra parallel, rather coarsely and confluent punctured, pubescent, and, except for pale margin, entirely shining blue green, or with a median pale vitta reaching apex. Body beneath with metasternum and abdomen usually dark except in middle and on the last ventral segment. Length, 5 mm. to 6 mm.; width, 2 mm. to 2.2 mm.

Type.—Collected at Winona, Wis., no collector given. Formerly in Brooklyn Museum collection. U. S. N. M. No. 43020 (with 3 paratypes).

Distribution.—Wisconsin (Winona); Ontario (Nepigon, Michipicoten); Manitoba (Aweme); Alberta (Medicine Hat).

Food plant.—Goldenrod, *Solidago* (F. S. Carr).

Remarks.—Although readily separable by its bright blue-green elytra from typical *convergens*, which is usually of a dull yellow-green, there are few structural characters by which to distinguish this from *convergens*. In collections it has frequently been labeled *flavolimbata*, and has apparently never been associated with *convergens*. It is quite unlike the California *flavolimbata*, not only in its small size and parallel shape, but also in the black coloring of the occipital and pronotal spots and ventral surface. The ventral surface in the paler, vittate specimens is pale with only a narrow darker margin, which is not typical of vittate *convergens*. It is also not quite so densely pubescent.

9. TRIRHABDA PILOSA, new species

Plate 1, Figure 9

Description.—Small, subparallel, covered with moderately dense, white pubescence; head with wide, dark plaga, prothorax with large black spots, elytra entirely green except for pale margin and short median basal vitta not reaching middle, ventral surface mostly dark. Head densely covered with long, white pubescence over the wide black occipital plaga, this plaga often with metallic luster, and extending down front and about upper part of eyes. Antennae with third and fifth joints subequal. Prothorax approximately twice as broad as long, with slightly arcuate sides, very obtusely angulate at middle; surface alutaceous with coarse punctures, pubescent; spots large, black, sometimes in contact. Scutellum usually black, sometimes with pale tip. Elytra finely punctate, densely and finely pubescent; green except for margin and small pale median area between scutellum and humerus, this becoming attenuated and disappearing before middle. Body beneath pale with metasternum and

abdomen, except for last segment, dark with metallic luster and densely pubescent. Legs with outer edge darkened. Length, 4.5 mm. to 6.8 mm.; width, 1.8 mm. to 2.8 mm.

Type.—Collected by D. H. Blake, September, 1927, at Mammoth, Yellowstone Park, Wyo. U. S. N. M. No. 43021 (with 71 paratypes). Four paratypes each in collections of C. A. Frost, F. S. Carr, H. P. Löding, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, Illinois State Natural History Survey, and University of Kansas.

Distribution.—Wyoming, Nevada, California (Nevada County, Truckee, Tallac, Lake Tenaya, Yosemite).

Food plant.—Sagebrush, *Artemisia tridentata* Nuttall (D. H. Blake).

Remarks.—This small species somewhat resembles *attenuata* in elytral markings, and has been confused with it. It is smaller than *attenuata*, and the dense white pubescence of the prothorax, as well as the larger pronotal spots, at once differentiates it. The elytra are yellowish green rather than bluish green, as is more often the case in *attenuata*, and the median vitta rarely reaches the middle of the elytra, whereas in *attenuata* it attains the middle and not infrequently extends nearly to the apex. The ventral surface of *pilosa* is also much darker than in *attenuata*. Its range also is different, as it occurs from Wyoming to the Sierra Nevada in California, while *attenuata* is found from the Great Plains to the Rocky Mountains.

10. TRIRHABDA ATTENUATA (Say)

Plate 1, Figure 10

Galleruca attenuata SAY, Journ. Acad. Nat. Sci. Philadelphia, vol. 3, p. 459, 1824.

Trirhabda attenuata LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 220, 1865.

Description.—Elongate, finely punctate, lightly pubescent; pale yellow with wide black plaga over occiput, pronotum with usual three spots, elytra with wide blue or green lateral and sutural vittae coalescing usually at middle and leaving only an attenuated pale vitta, wider at base, on either elytron. Head rugosely punctate over occiput, moderately densely pubescent, a wide dark plaga with usually green luster across base of head curving down over front. Antennae with third joint shorter than fifth. Prothorax approximately twice as wide as long, with arcuate sides, shining, with scattered coarse punctures, surface sometimes lightly pubescent; spots small, median one situated nearer base than anterior margin. Scutellum frequently with paler outer margin. Elytra finely punctate.

tate, moderately pubescent, surface somewhat shining. Vittae bright blue-green or blue, wide, usually coalescing at or behind middle, leaving a pale vitta wider at base and becoming attenuated toward apex, occasionally the pale vitta extending nearly to apex, but sutural and lateral vittae always united. Body beneath pale with metasternum and sides of abdomen dark with metallic luster, densely covered with white pubescence. Length, 5 mm. to 8 mm.; width, 2 mm. to 3.8 mm.

Type locality.—Collected by T. Nuttall "in Mississippi" (on the Mississippi?).

Distribution.—South Dakota (Black Hills, Dewey, Fall River County, Hat Creek); Nebraska (Hat Creek); Kansas (Cheyenne County); Montana (Poplar, Musselshell County, Meagher County, Huntley, Gallatin Mountains, Assiniboine, Glendive); Wyoming (Platte County); Colorado (Eckley, Morrison); Utah; Alberta (Medicine Hat); British Columbia.

Food plants.—Sagebrush, *Artemisia*, and goldenrod, *Solidago* (F. S. Carr).

Remarks.—Say's name *attenuata*, based on specimens "captured by Mr. Nuttall in Mississippi," was adopted by LeConte for this species, although Say's description of the elytra as polished does not fit either this or any other *Trirhabda*. The elytra are somewhat shining with metallic luster and are very finely punctate. The type locality, also, seems somewhat doubtful; I have seen no specimens taken east of the Dakotas, Nebraska, and Kansas. Possibly Nuttall collected it along the Mississippi or its branches.

11. TRIRHABDA LEWISII Crotch

Plate 1, Figure 11

Trihabda (sic) lewisii CROUCH, Proc. Acad. Nat. Sci. Philadelphia, vol. 25, p. 56, 1873.

Trirhabda lewisii HORN, Trans. Amer. Ent. Soc., vol. 20, p. 70, 1893.

Description.—Of moderate size, elongate, parallel, lightly punctate and pubescent; pale yellow with wide black plaga across occiput, moderate-sized black pronotal spots, elytra with moderately wide lateral and sutural vittae, green, blue, purple, or piceous, these vittae usually united at apex. Head alutaceous with obsolete, shallow, coarse punctures over occiput, lightly pubescent; a wide black plaga extending across base of head and curving widely over front. Antennae with third and fifth joints subequal. Prothorax fully twice as broad as long with arcuate sides, surface not shining, alutaceous with scattered coarse punctures; spots moderately large. Scutellum bicolored. Elytra lightly punctate, pubescence short and inconspicuous; a moderately wide lateral and sutural vitta, usually

uniting at apex, and with metallic luster, most frequently green, but often bluish or purplish or infrequently even piceous. Body beneath pale with darker margins to metasternum and abdomen. Length, 5 mm. to 7.5 mm.; width, 1.8 mm. to 3 mm.

Type locality.—New Mexico. Collected by Doctor Lewis.

Distribution.—Montana (Musselshell County); Wyoming (Yellowstone Park, Rock River); Colorado (Custer County, Paonia, Fort Collins, Grand Junction, Creede, Salida, Saguache, Durango, Garland, Colorado Springs, Colbran, Glenwood Springs, Buena Vista); Utah (Uinta National Forest, Beaver Range Mountains); New Mexico (Taos, Jemez Mountains).

Food plant.—*Chrysothamnus* of the *C. nauseosus* group (D. H. Blake).

Remarks.—Except for the size and coloring of the vittae, this species is subject to little variation. A series of specimens, however, from Creede, Colo. (University of Kansas collection), is very heavily marked, the occipital plaga extending to the eyes, the pronotal spots touching each other, and in some specimens the elytral vittae so wide as to coalesce and produce typical *convergens* or even *attenuata* markings. The scutellum is usually bicolored even in the darkest specimens. *T. nitidicollis* is larger and more robust than *lewisii* and does not have the wide basal plaga on the head or as large pronotal spots. The pronotum in *lewisii* is not polished as in *nitidicollis*, but the elytra resemble those of that species in being finely punctate although more lightly pubescent.

12. TRIRHABDA NITIDICOLLIS LeConte

Plate 1, Figures 12, 12a

Trirhabda nitidicollis LeConte, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 219, 1865.

Description.—Oblong, pale; prothorax shining, not depressed, with small spots; elytra usually with narrow vittae, sometimes piceous, frequently blue, green, or purple. Head finely alutaceous, sometimes with coarse punctation, lightly pubescent over occiput; occipital spot usually with metallic luster, sometimes piceous, wider at base and narrowing down front into a point. Antennae with third joint shorter than fifth. Prothorax large, barely twice as broad as long, obtusely angulate at middle of lateral margin; surface very polished, sometimes nearly impunctate; spots small, piceous, the median one tending to be diamond-shaped, occasionally evanescent. Scutellum bicolored, infrequently entirely pale. Elytra oblong with broad apex, finely and obsoletely punctate, finely pubescent; vittae generally narrow and united at apex, varying from piceous (in many New Mexico and Arizona specimens) to blue or

green (particularly well marked in Montana, Idaho, and some California specimens). Body beneath entirely pale. Length, 7 mm. to 9 mm.; width, 2.8 mm. to 3.8 mm.

Type locality.—New Mexico. Collected by Fendler.

Distribution.—Montana (Dillon); Idaho (Soda Springs); Wyoming (Yellowstone Park); Colorado (Sedalia, Canon City); Utah (Beaver Canyon); Nevada (Esmeralda); New Mexico (Lamy); Arizona (Bright Angel, Squaw Springs); California (Los Angeles County, Chino Canyon, Lebec, Bishop).

Food plants.—*Gutierrezia sarothrae* (Caudell), *Chrysothamnus* of the *C. nauseosus* group (D. H. Blake), sagebrush, *Artemisia* sp. (R. Hopping).

Remarks.—This species is distinguished by its large, polished, and not depressed prothorax. A series of specimens from Los Angeles County, Calif., collected by Coquillett, and a series from Esmeralda, Nev., present considerable variation. They are smaller (6 mm. to 8 mm.), with less well-defined vittae, which do not join at the apex; the pronotum is somewhat depressed and has scattered coarse punctures, contrasting with the polished, nearly impunctate surface of typical *nitidicollis*, and the spot on the head is larger.

13. TRIRHABDA ERIODICTYONIS Fall

Plate 1, Figure 13

Trirhabda eriodictyonis FALL, Can. Ent., vol. 39, p. 243, 1907.

Description.—Elongate, dull yellow-brown, head with a narrow occipital spot; prothorax 3-spotted, shining, angulate; elytra usually with darkened humeral spot or this occasionally extended into lateral vitta having a metallic luster. Head densely and moderately coarsely punctate, with pale light pubescence; a narrow, sometimes linear, black spot down vertex, broader in male. Antennae with third joint slightly shorter than fifth. Prothorax twice as broad as long, usually with prominent median angle on lateral margins; surface shining with only sparse coarse punctures; spots small and tending to be diamond-shaped. Scutellum pale, usually with narrow piceous margin at base. Elytra elongate, somewhat narrowed toward apex, densely and finely punctate, with fine, dense, short but not conspicuous pubescence. A dark humeral spot, sometimes extending into a narrow lateral vitta with greenish metallic luster. Body beneath entirely pale. Length, 5 mm. to 9 mm.; width, 1.8 mm. to 3.5 mm.

Type locality.—"Pasadena, San Bernardino, and elsewhere in southern California."

Distribution.—Utah (Washington County); California (Los Angeles County, Claremont, Cajon Pass, Mojave Desert, Pasadena, Mount Wilson, Chino Canyon).

Food plant.—*Eriodictyon* sp.

Remarks.—In this species the difference in size of the sexes is very apparent, the male being sometimes a third smaller than the female. The shining prothorax resembles that of *nitidicollis*, but it is usually more depressed and not so long. The elytral vittae are usually much less marked than in *nitidicollis*, there being in most specimens no evidence of sutural vitta beyond a slight darkening of the sutural edges. The aedeagus is short and rather blunt. Except for one specimen in the Casey collection labeled Washington County, Utah, I have seen specimens only from southern California.

14. TRIRHABDA DIDUCTA Horn

Plate 1, Figure 14

Trirhabda diducta HORN, Trans. Amer. Ent. Soc., vol. 20, p. 70, 1893.

Description.—Elongate, subparallel, pale yellow-brown, with shining, 3-spotted prothorax; elytra with blue, green, or purple sutural and lateral vittae, usually also a narrow median vitta, not reaching base and uniting with lateral vitta toward apex. Head punctate over occiput and front, lightly pubescent, a moderately broad, black, oblong spot on occiput extending down front. Antennae with third joint slightly shorter than fifth. Prothorax approximately twice as broad as long, with arcuate sides, scarcely angulate; surface shining with scattered coarse punctures; spots black, moderate in size, often becoming small and diamond-shaped. Scutellum piceous, frequently with pale apex. Elytra finely and obsoletely punctate, pubescence fine, short, and dense; sutural and lateral vittae usually not wide, a narrow median vitta frequently arising before middle and uniting with lateral vitta before apex, this median vitta often faint and evanescent; lateral and sutural vittae usually uniting at apex, with blue, green, or purple luster. Body beneath pale with margin of metasternum and abdomen sometimes darkened. Length, 6.5 mm. to 9 mm.; width, 2.5 mm. to 4 mm.

Type locality.—"Western Nevada and adjacent regions of California."

Distribution.—Nevada; California (Mokelumne Hill, Tulare County, Mount Tamalpais, Santa Clara County, Fresno, Ahwahnee).

Food plant.—*Eriodictyon californicum* (Hooker and Arnott) Greene.

Remarks.—*T. diducta* and *T. eriodictyonis* are closely related structurally, although appearing very unlike in their extremes of coloration. The paler specimens of *diducta* are hard to distinguish from the darker specimens of *eriodictyonis*. Both have a broad shining prothorax, which in *eriodictyonis* is usually quite angulate, while in *diducta* it is arcuate or very obtusely angulate. A short, blunt-tipped aedeagus is common to both. Both occur on the same food plant, *Eriodictyon* (Hydrophyllaceae). I have found one other species, *T. flavolimbata*, in small numbers on *Eriodictyon*, although its preferred food plant is *Baccharis pilularis* De Candolle. *T. diducta* can be separated from *nitidicollis* not only by the peculiar short aedeagus but also by the oblong shape of the occipital spot and the less angulate prothorax with usually larger spots.

15. *TRIRHABDA LUTEOCINCTA* (LeConte)

Plate 2, Figure 15

Galleruca luteocincta LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 4, p. 88, 1858.

Trirhabda luteocincta LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 220, 1865.

Description.—Large, elongate, robust, pale with dark metallic luster on upper portion of head, large shining dark spots with green luster on prothorax, and green, blue, or nearly black elytra, these infrequently vittate. Head rather finely but densely punctate and covered with long white pubescence over occiput; a wide, shining dark metallic plaga across base of head, curving down well over front, and frequently a spot on margin of eyes in front. Antennae with third joint shorter than fifth. Prothorax scarcely twice as broad as long, with obtusely angulate margins, and with scattered coarse punctures, occasionally a light pubescence more conspicuous on sides, very shining, 3-spotted, the spots very large and with metallic blue or green luster. Scutellum usually black, except in vittate specimens, then bicolored. Elytra shining, moderately coarsely punctate and with long, pale, silky pubescence, and, except for pale margin, usually dark green, blue, or violet, appearing nearly black, sometimes with a pale median vitta on each elytron extending well down and sometimes reaching apex. Body beneath with abdomen and sides of metasternum dark with metallic luster, outer edge of femora dark green. Length, 8.5 mm. to 10.5 mm.; width, 3 mm. to 4 mm.

Type locality.—"San Diego, also Santa Cruz, Calif."

Distribution.—California (Orange County, Los Angeles, Ventura, Santa Barbara County).

Food plants.—Sagebrush, *Artemisia* sp. (LeConte), *Aplopappus squarrosus* Hooker and Arnott (Blake), greasewood, *Covillea tridentata* (R. S. Vaile).

Remarks.—There is one dark specimen of this in the Bowditch collection labeled "Florida," and I have also examined four specimens from the Horn collection labeled "New Jersey." These are typical *luteocincta*, two being vittate and two with dark-blue elytra, appearing nearly black. I doubt the correctness of the labels, as the species is otherwise known only from the coast of middle and southern California. The aedeagus differs from that of most of the species in its extremely long and tapering tip, but agrees in this respect with two closely related California species, *labrata* and *confusa*.

16. TRIRHABDA CONFUSA, new species

Plate 2, Figure 16

Description.—Closely resembling *luteocincta* but smaller, with less heavily marked head and pronotum and paler ventral surface. Head moderately coarsely punctate, and with long but not dense pubescence, a broad dark occipital spot with metallic luster, usually not covering base of head, and curving down front often to an acute point, but rarely extending to eyes. Antennae with third joint shorter than fifth. Prothorax scarcely twice as wide as long, with obtusely angulate sides; surface shining, not greatly depressed, with few scattered punctures; spots small, usually piceous, sometimes with inconspicuous metallic luster, median one small, rounded or diamond-shaped. Scutellum usually bicolored. Elytra finely and densely punctate, with long silky pubescence, entirely blue or green except for pale margin or occasionally vittate with pale median vitta not reaching apex. Body beneath pale, frequently with dark metallic margin to metasternum and abdomen. Legs entirely pale or with only small darker spot on outer side of femora. Length, 7 mm. to 8.5 mm.; width, 2.8 mm. to 3.8 mm.

Type.—Collected by D. W. Coquillett in Los Angeles County, Calif. U.S.N.M. No. 43022 (with 2 paratypes).

Distribution.—California (San Gabriel, Los Angeles County, Bakersfield, Lebec, Bishop, Yreka).

Food plant.—Sagebrush, *Artemisia* sp. (R. Hopping).

Remarks.—The prothorax of this species suggests in its shining surface that of *nitidicollis*, but the long, dense, silky pubescence of the elytra as well as the differently shaped aedeagus separates it from that species. It is closely related to *luteocincta* and may be only a regional variety, although the aedeagus is not exactly similar, having a tapering tip, which is distinctly shorter and more pointed

than that of *luteocincta*. It is also smaller and of paler coloring. The pronotal spots are never very large and are usually piceous. It ranges farther inland and northward than *luteocincta*. *T. flavolimbata* is more oval, usually not so long and parallel in shape, and has more coarsely punctate, less pubescent elytra, and usually a wider occipital band.

17. TRIRHABDA LABRATA Fall

Plate 2, Figure 17

Trirhabda labrata FALL, Can. Ent., vol. 39, p. 242, 1907.

Description.—Medium sized, parallel, pale with brilliantly shining green or blue-green markings, a wide plaga over base of head, very large contingent spots on pronotum, and elytra, except for margin, unicolorous. Head obsoletely and confluent punctate, nearly smooth, and lightly pubescent, a shining wide green plaga across base of head, extending well down front and in some specimens encircling eyes, labrum dark. Antennae with third joint shorter than fifth. Prothorax barely twice as broad as long, with arcuate, sometimes obtusely angulate sides, very shining, with scattered coarse punctures; spots large, often touching and with metallic luster. Scutellum black. Elytra coarsely, densely, and rugosely punctate, with short, inconspicuous, and sparse pubescence, very shining and entirely green or blue-green except for narrow pale margin. Body beneath pale with metasternum and abdomen except for last segment dark metallic green; outer femora and tibiae and occasionally tarsi also dark. Length, 6 mm. to 7.5 mm.; width, 2 mm. to 3 mm.

Type locality.—Monterey, Calif.

Distribution.—California (Monterey, Guadalupe).

Food plants.—*Aplopappus ericoides* (Lessing) Hooker and Arnott (D. H. Blake), "*Biglovia* sp." (= *Aplopappus* sp.) (Blaisdell), chamiso, *Adenostoma fasciculatum* Hooker and Arnott (Coleman).

Remarks.—*T. labrata*, while very closely related to *luteocincta*, is a much more brilliant species on account of its very scant pubescence and its broader markings with lustrous green or blue-green metallic coloring. It is also slightly smaller than *luteocincta* and has more coarsely punctate elytra. The shape of the aedeagus is similar to that of *luteocincta*. No vittate form has been seen.

18. TRIRHABDA SERICOTRACHYLA, new species

Plate 2, Figure 18

Description.—Of similar shape and coloring to *T. luteocincta*, but smaller and with pubescent, closely and coarsely punctate prothorax, and paler ventral surface. Head densely and rugosely but not

coarsely punctate, and with dense pale pubescence over occiput; basal plaga wide, dark green with metallic luster, not usually encircling eyes. Antennae with third joint shorter than fifth. Prothorax barely twice as broad as long, with sides arcuate, sometimes very feebly angulate at middle; densely, coarsely punctate, usually with fairly dense pubescence; spots moderately large and usually lacking metallic luster. Scutellum black, frequently in paler (vittate) specimens with pale margin. Elytra covered with silky pubescence, hiding the fine, dense punctation; sometimes entirely shining blue or green with pale margin, sometimes with lateral, sutural, and often traces of median vittae, as in *diducta* (no specimens seen in which lateral and sutural vittae were not united at apex). Body beneath pale with only margin of metasternum and abdomen darker, a spot on outer femora also frequently dark metallic in color in darker specimens. Length, 6.8 mm. to 8 mm.; width, 2.8 mm. to 3.5 mm.

Type.—Collected at San Diego, Calif. U.S.N.M. No. 43023 (in Casey collection) (with 15 paratypes).

Distribution.—California (Los Angeles, Pasadena, Redondo, Santa Barbara County, Independence, Warners Hot Springs, Bishop, Red Bluff).

Food plant.—*Artemisia californica* Lessing.

Remarks.—This species has always been confounded with *luteocincta*, which it resembles in general shape and coloring. It differs from that species, however, in being somewhat smaller and in having a much more coarsely punctate and pubescent thorax, and in having a paler scutellum and ventral surface. The aedeagus is also utterly different in shape from that of *luteocincta*. The species ranges from the seacoast of southern California northward through the Sierras.

19. TRIRHABDA FLAVOLIMBATA (Mannerheim)

Plate 2, Figure 19

Galleruca flavolimbata MANNERHEIM, Bull. Moscou, vol. 16, part. 2, p. 308, 1843.

Trirhabda flavolimbata LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 220, 1865.

Description.—Robust, of medium size, oblong (in females somewhat oval), pale with shining metallic-green or blue plaga across base of head, dark spots with metallic luster on pronotum, and elytra entirely blue or green except for pale margin. Head moderately coarsely punctate, lightly pubescent, a wide plaga with metallic luster over base of head curving down front, but not encircling eyes. Antennae with third joint shorter than fifth. Prothorax scarcely twice as broad as long, with sides feebly arcuate, not at all angulate, shining, with scattered coarse punctures; spots usually large and with inconspicuous metallic luster. Scutellum

dark, occasionally with paler margin. Elytra densely and rather coarsely and rugosely punctate and covered with moderately dense pubescence, entirely blue or green except for pale margin. Body beneath pale with metasternum and abdomen except for tip of last ventral segment dark shining green, legs with outer edge also darkened. Length, 5 mm. to 8 mm.; width, 2 mm. to 3.5 mm.

Type locality.—California.

Distribution.—California (Searsville Lake, near Stanford University; Marin County).

Food plants.—*Baccharis pilularis* De Candolle, also in small numbers on near-by *Eriodictyon* (D. H. Blake).

Remarks.—The pubescence on the elytra and the smaller, less metallic spots on the pronotum separate this species from *labrata*. The aedeagus, too, is quite distinct from the long tapering one of *labrata*. There is apparently no vittate form. One can not be entirely certain whether this or *labrata* is the true *flavolimbata* of Mannerheim, since the description fits either, and the type locality is only "California." *T. labrata* is recorded only from Monterey and Guadalupe, and since the headquarters of the expedition on which *flavolimbata* was collected were at San Francisco, in which region this species is known to occur, it is more probable that this species is the true *flavolimbata* of Mannerheim.

20. TRIRHABDA NIGROHUMERALIS Schaeffer

Plate 2, Figure 20

Trirhabda nigrohumeralis SCHAEFFER, Brooklyn Inst. Mus. Sci. Bull., vol. 1, p. 170, 1905.

Description.—Small, elongate, somewhat more oval than usual in *Trirhabda*, dull pale brown with small occipital and pronotal spots and darkened humeri. Head moderately coarsely, shallowly, and densely punctate, with light pubescence; occipital spot usually small and oblong. Antennae with third and fifth joints subequal. Prothorax about twice as wide as long, with sides slightly arcuate, not at all angulate; surface alutaceous, somewhat pubescent, with scattered coarse punctures; spots small and black. Scutellum dark with pale tip. Elytra densely, not coarsely punctate, with short fine pubescence; pale brown with only the humeri darkened. Body beneath entirely pale. Length, 5 mm. to 7 mm.; width, 2 mm. to 3 mm.

Type locality.—Palmerlee, Cochise County, Ariz.

Distribution.—Arizona (Huachuca Mountains, Santa Rita Mountains, Prescott, Ashfork, Palmerlee, Bright Angel, Oracle); New Mexico (Las Vegas, Jemez Mountains).

Food plant.—*Brickellia* sp. (E. A. Schwarz).

Remarks.—The pale forms of *geminata* are sometimes difficult to distinguish from this species. In general, *nigrohumeralis* is smaller, and the punctation of the pronotum is not so coarse and dense. The aedeagus is quite unlike that of *geminata*, being small, tapering, and rounded at the tip.

21. TRIRHABDA CADUCA Horn

Plate 2, Figure 21

Trirhabda caduca HORN, Trans. Amer. Ent. Soc., vol. 20, p. 69, 1893.

Description.—Oblong, coarsely punctate and moderately shining, yellow with broad black plaga across base of head, three pronotal spots, and narrow reddish-brown sutural and lateral vittae, the latter evanescent in part. Head rather coarsely punctate; a broad black band extending nearly across base of head and down vertex. Antennae with third joint a little shorter than fifth. Prothorax twice as wide as long with arcuate sides; surface shining, sparsely and coarsely punctate, with the usual three spots. Scutellum either entirely piceous or bordered with yellow, not pubescent. Elytra oblong, coarsely but only moderately densely punctate, shining, very indistinctly pubescent; sutural edges darkened, lateral vittae very narrow and often evanescent and interrupted. Body beneath entirely pale. Length, 5.5 mm. to 6.5 mm.

Type locality.—Owens Valley, Calif.

Distribution.—Owens Valley, Calif.

Remarks.—This species is one of the rarest in collections, and I have seen only the original specimens of Horn. It is a very distinct species and unusual in its nearly glabrous, coarsely punctate elytra and short, oblong shape. It differs from *eriodictyonis* in its wider head markings and sparser, coarser punctation, as well as in its lack of pubescence and in the character of the elytral vittae. The lateral vittae appear farther from the margin than those of *eriodictyonis* and are plainly visible when viewed from above. It differs from *geminata* and *nigrohumeralis* also in its lack of pubescence, coarser punctation, and shining surface and in the nature of the vittate markings.

22. TRIRHABDA GEMINATA Horn

Plate 2, Figure 22

Trirhabda geminata HORN, Trans. Amer. Ent. Soc., vol. 20, p. 68, 1893.

Description.—Medium sized, rather coarsely punctate, sometimes pale brown with only faint traces of reddish-brown vittae, sometimes with distinctly marked lateral, sutural, and median vittae, these vittae occasionally coalescing to produce nearly piceous elytra. Head alutaceous with coarse obsolete punctation, moderately pubes-

cent; in darker specimens frequently with black occipital spot extending across head, about eyes, and down front, in paler specimens this plaga reduced to a spot. Labrum usually piceous. Antennae with third joint slightly shorter than fifth. Prothorax not twice as broad as long, with slightly arcuate sides, without angles; surface alutaceous, densely and coarsely punctate, sometimes lightly pubescent; spots black, of moderate size. Scutellum frequently bicolored in paler specimens. Elytra densely and moderately coarsely but shallowly and confluent punctate, with fine short pubescence; in pale specimens with only traces of pale reddish-brown vittae; in better marked ones with a wide reddish-brown sutural vitta and lateral vitta and more feebly defined median one, not reaching base, and uniting with lateral and sutural vittae near apex; in dark specimens elytra almost entirely piceous. Body beneath unusually pale brown, deepening to reddish brown in dark specimens.

Length, 5.5 mm. to 7 mm.; width, 2.8 mm. to 3.5 mm.

Type locality.—"Occurs at San Diego, California, and Arizona."

Distribution.—Arizona (Tucson, Catalina Springs, northeast of Tucson; Prescott, Nogales, Santa Rita Mountains), California (San Diego, Claremont, Los Angeles, Idylwild).

Food plant.—*Encelia farinosa* Gray (E. A. Schwarz), *Bahia* sp.

Remarks.—Specimens from southern California near the coast are darker in their markings than many of the inland specimens. One from Idylwild, Calif. (collection of Kansas University), has elytral markings similar to those of *canadensis*, with no trace of a median vitta, although the others of the same series are typically colored dark specimens.

DEROSPIDEA, new genus

Oblong, subparallel, robust. Head glabrous, vertical, a median line over occiput and front; antennae with fourth joint longer than third, third and fifth subequal. Prothorax considerably more than twice as broad as long, depressed, lateral margins arcuate, tending to be obtusely angulate at middle. Scutellum truncate. Elytra oblong, pubescent, indistinctly margined, epipleura becoming indistinct behind middle. Tibiae feebly grooved for less than their entire length, first tarsal joint longer than second, claws bifid. Aedeagus short, with broad truncate tip.

Type of genus.—*Trirhabda brevicollis* LeConte.

This genus is distinguished from *Trirhabda* by the prothorax, which in *Trirhabda* is approximately twice as broad as long; by the aedeagus, which is short and broad and without a pointed tip, and at its base has a wider and thickened chitinous band with distinct free tips on the ventral side; and by the pattern of coloration and pubescence. In *Trirhabda* there is always a well-marked occipital spot and the occiput is always pubescent, usually conspicuously so.

In *Derspidea* the occipital spot may be present or absent, and the head is glabrous. The three pronotal spots in *Trirhabda* are always present; in *Derspidea* they are evident in one species, vestigial or absent in two other species. When present, the median spot in *Derspidea* tends to be Y-shaped. The elytra are only feebly margined and are rounder and less parallel-sided than in *Trirhabda*.

Derspidea is separated from *Monocesta* by having the fourth antennal joint longer than the third and by the shape of the aedeagus. The genus *Monocesta* as described by Clark was divided into two subgroups, the first with the elytra postmedially dilated and the second with the elytra more parallel. Weise has designated as the type of the genus the first species of the first group (*Monocesta imperialis* Clark). *Monocesta cyaneomaculata* Jacoby, which I place in the genus *Derspidea*, was probably considered to belong in the second group of *Monocesta*, although the length of the antennal joints should have excluded it. The aedeagus of *Monocesta coryli* (pl. 2, fig. 27), the common United States species with postmedially dilated elytra, is quite unlike that of *Trirhabda* or *Derspidea*, being short and very broad with a short tip.

1. DERSPIDEA BREVICOLLIS (LeConte)

Plate 2, Figure 23

Trirhabda brevicollis LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, p. 221, 1865.

Description.—Robust, oblong, with very short prothorax, dull pale yellow with reddish-brown darkening of antennae and tarsi, dark occipital spot and three often indistinct pronotal spots; elytra with wide reddish-brown sutural and lateral vittae, usually united at apex. Head pale, occiput shining, impunctate, glabrous, with coarse, shallow punctures about vertical fovea on front and between eyes, a more or less evanescent reddish-brown spot on occiput extending down vertex. Antennae with third and fifth joints subequal. Prothorax considerably over twice as broad as long, with very arcuate sides, often obtusely angulate at middle; median spot Y-shaped, spots frequently evanescent; surface dimly alutaceous, with often rather dense coarse punctures. Scutellum usually bicolored, apex darkened by sutural vitta. Elytra oblong with feeble margin, densely punctate throughout, more coarsely so at base, with fine short pubescence; reddish-brown sutural vitta widest at base, but scarcely attaining base of elytra and tapering to apex, at apex uniting with wide lateral vitta, margin and epipleura often entirely darkened. Body beneath pale with tibiae and tarsi darkened. Length, 6.5 mm. to 9.5 mm.; width, 3 mm. to 4.5 mm.

Type locality.—"Abundant in Southern States, near sea coast, one specimen from Kansas."

Distribution.—Michigan; Illinois (Edgebrook); Indiana (De Kalb County); Iowa (Ames); Kansas; Texas; Louisiana (Baton Rouge); Mississippi; Alabama (Mobile); Florida; South Carolina.

Food plant.—Prickly-ash, *Zanthoxylum*; orange, *Citrus aurantium*.

Remarks.—This species has always been considered of the genus *Trirhabda*, although its specific name called attention to its unusual thoracic shape. LeConte placed it at the end of his species, remarking that it was easily known by its very short thorax. Other characters unite to make it unlike the other species of *Trirhabda*, and chief among them the unusual structure of the aedeagus. The species is not found on composites, but breeds on *Zanthoxylum*, and occasionally is a pest to orange, both of the Rutaceae. The larval habits described in the introduction are also unusual as far as is known in the genus *Trirhabda*.

2. DEROSPIDEA ORNATA (Schaeffer)

Plate 2, Figure 24

Trirhabda ornata SCHAEFFER, Brooklyn Inst. Mus. Sci. Bull., vol. 1, no. 6, p. 137, 1905.

Description.—Oblong, dull, pale yellow, head without occipital spot, pronotum with very indistinct indication of four spots, elytra with wide basal violet fascia, uniting with sutural vitta, a wide lateral spot from middle nearly to apex, attaining lateral margin. Head somewhat wrinkled on front, occiput glabrous without dark spot. Antennae with third and fifth joints equal. Prothorax fully two and a half times as broad as long, with obtusely angulate sides; surface densely and coarsely punctate, pale with faint indications of four spots, two lateral, two smaller ones near middle anteriorly. Scutellum entirely pale. Elytra coarsely and densely punctate and covered with dense short pubescence; pale with wide, violet-colored, basal band, uniting with sutural vitta, a wide lateral spot extending to margin but not reaching apex or suture. Body beneath entirely pale, the femora, tibiae, and tarsi darker. Length, 8 mm.; width, 3.5 mm.

Type locality.—Esperanza Ranch, Brownsville, Tex.

Food plant.—Unknown.

Remarks.—This species is very closely related to the Mexican *Monocesta cyanomaculata*, which also belongs to the genus *Derospidea*, and until a larger series of both can be examined, their specific distinctness must remain in doubt. The only specimen of *cyanomaculata* I have seen has a broader prothorax, and the elytral spots are not so large, although similarly placed. The sculpture and pubescence are similar, however.

I have not dissected *Derospidea ornata*, as only the type specimen is known, but H. S. Barber kindly dissected for me the single specimen of *cyaneomaculata* in the United States National Museum collection. The aedeagus is strikingly like that of *brevicollis* in shape. All three species are similar in having glabrous heads and in the shape of the markings on the pronotum. The faint pronotal spotting of *ornata*, overlooked by Schaeffer, resembles that of the more weakly marked specimens of *brevicollis*, particularly in the traces of the Y-shaped median spot.

1. CORAIA SUBCYANESCENS (Schaeffer)

Plate 2, Figure 26

Trirhabda subcyanescens SCHAEFFER, Brooklyn Inst. Mus. Sci. Bull., vol 1, no. 9, p. 241, 1906.

Description.—Stout, parallel, coarsely punctate, not shining, light rufous with wide metallic-green spot on occiput, prothorax with three large piceous spots, elytra deeper reddish with variable green metallic luster, sometimes confined to humeri, scutellar region, and suture, sometimes over entire elytra. Head slightly produced frontally by dark tubercles above base of antennae; coarsely and rugosely punctate, with thick pubescence; a wide oblong dark spot over occiput and down front, with greenish luster. Antennae robust and dark, longer and stouter in male, and in both sexes having the basal, third, and fourth joints subequal. Prothorax not quite so broad as long, subquadrate, with nearly straight sides, as viewed from above; alutaceous with dense, almost rugose punctures over greater part, and densely pubescent; three large black spots, the lateral ones covering margin. Scutellum, sometimes entirely pale, again darkened apically. Elytra densely and coarsely punctate and moderately pubescent, reddish with green luster, sometimes more marked on humeri, about scutellar region and suture, and sometimes evenly distributed over elytra. Body beneath reddish with sides of metasternum, a spot on femora, and tibiae and tarsi dark. Outside edge of tibiae conspicuously smooth, shining, and ridged in basal portion with sulci on either side of the ridge. Length, 7.5 mm. to 8 mm.; width, 3.8 mm.

Type locality.—Brownsville, Cameron County, Tex.

Distribution.—Texas (Edinburg, Harlingen, and Brownsville).

Food plant.—Unknown.

Remarks.—Clark differentiated this genus from related genera by its subquadrate thorax, its long robust antennae, the third and fourth joints of which are equal, and its parallel body. It is stouter and more heavily chitinized than *Trirhabda*, and the head is slightly produced frontally. The difference in the antennae in the two sexes is also peculiar to this in contrast with related genera. The shape

of the aedeagus is more like that of *Monocesta*. Clark described only one species, *maculicollis*, and his description, except for the larger size, applies perfectly to *subcyanescens*. In the United States National Museum collection are several specimens of *Coraia*, one of which is undoubtedly *maculicollis*. The others are all smaller, and the Texas ones smallest of all, but all of them are very similar in shape, coloring, and sculpture. It may be that *subcyanescens* is merely a dwarfed northern form of *maculicollis*, but the question can not be settled until a larger series of specimens can be compared. *C. subcyanescens* has been collected only at the very southern tip of Texas. Two other Mexican species, quite distinct from this or *maculicollis*, have been described by Jacoby—*apicornis*, with a 7-spotted pronotum, and *clarki*, with very sparsely punctate pronotum.

EXPLANATION OF PLATES

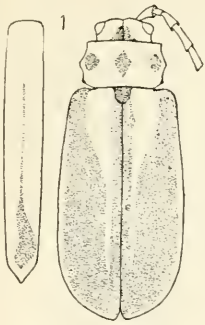
Beetles enlarged about three times; aedeagi, about eight times

PLATE 1

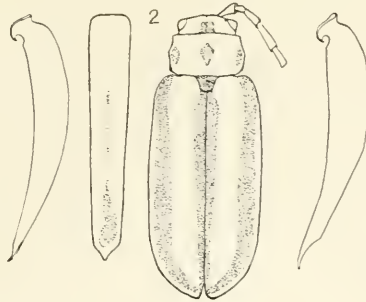
- Figure 1. *Trirhabda bacharidis* (Weber).
 2. *Trirhabda canadensis* (Kirby).
 3. *Trirhabda adela* Blake.
 4. *Trirhabda virgata* LeConte.
 5. *Trirhabda borealis* Blake.
 6. *Trirhabda neoscotiae* Blake.
 7. *Trirhabda convergens* LeConte.
 8. *Trirhabda viridicyanea* Blake.
 9. *Trirhabda pilosa* Blake.
 10. *Trirhabda attenuata* (Say).
 11. *Trirhabda lewisii* Crotch.
 12. *Trirhabda nitidicollis* LeConte.
 12a. *Trirhabda nitidicollis* var. LeConte.
 13. *Trirhabda eriodictyonis* Fall.
 14. *Trirhabda diducta* Horn.

PLATE 2

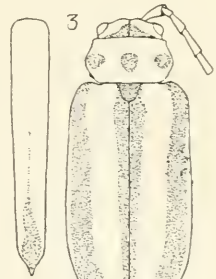
15. *Trirhabda luteocincta* (LeConte).
 16. *Trirhabda confusa* Blake.
 17. *Trirhabda labrata* Fall.
 18. *Trirhabda sericotrachyla* Blake.
 19. *Trirhabda flavolimbata* (Mannerheim).
 20. *Trirhabda nigrohumeralis* Schaeffer.
 21. *Trirhabda caduca* Horn.
 22. *Trirhabda geminata* Horn.
 23. *Derspidea brevicollis* (LeConte).
 24. *Derspidea ornata* (Schaeffer).
 25. *Derspidea cyaneomaculata* (Jacoby).
 26. *Coraia subcyanescens* (Schaeffer).
 27. *Monocesta coryli* (Say).



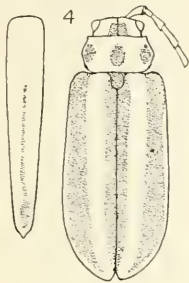
Trirhabda bacharidis



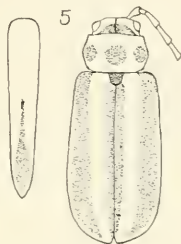
T. canadensis



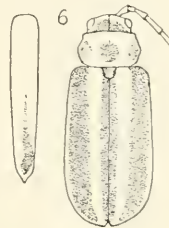
T. adela



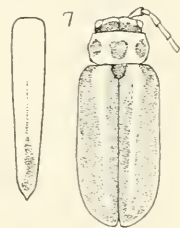
T. virgata



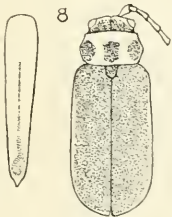
T. borealis



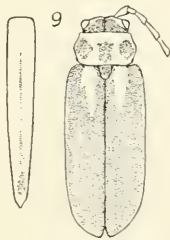
T. neoscotiae



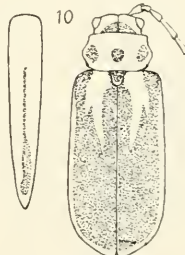
T. convergens



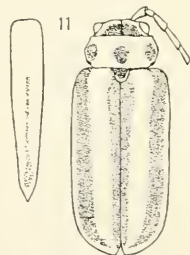
T. viridicyanea



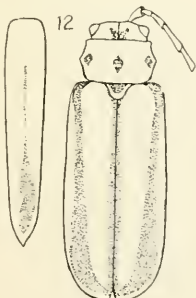
T. pilosa



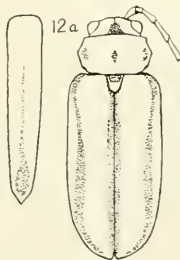
T. attenuata



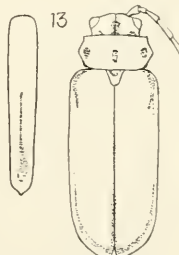
T. lewisii



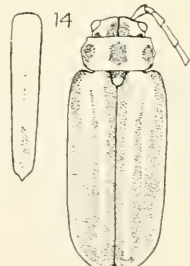
T. nitidicollis



T. nitidicollis var.



T. eriodictyonis



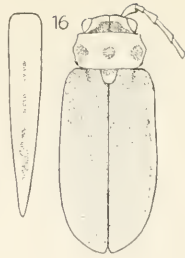
T. diducta

SPECIES OF TRIRHABDA

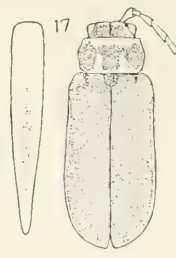
FOR EXPLANATION OF PLATE SEE PAGE 36.



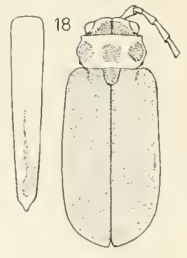
Trirhabda luteocincta



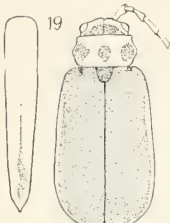
T. confusa



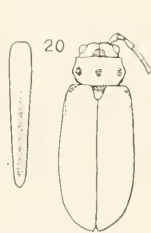
T. labrata



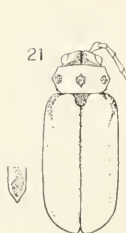
T. sericotrachyla



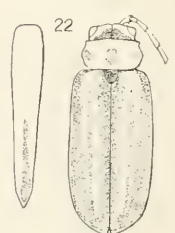
T. flavolimbata



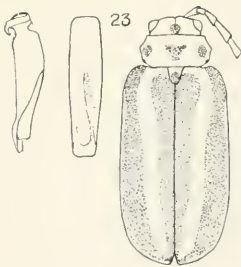
T. nigrohumeralis



T. caduca



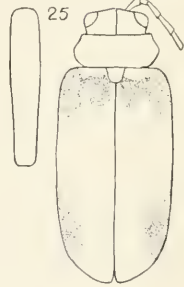
T. geminata



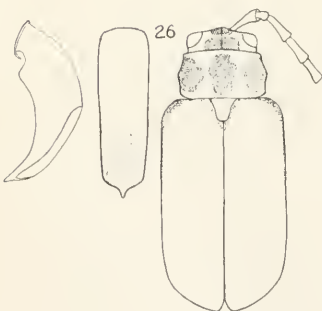
Derospidea brevicollis



D. ornata



D. cyaneomaculata



Coraia subcyanescens



Monocesta caryli