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(COLEOPTERA, CARABIDAE)

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INTRODUCTION

BEETLES BELONGING TO THE GENUS *Calosoma*, or "caterpillar hunters" as they have been so appropriately named, are of considerable economic importance, and at least one species, *Calosoma sycophanta*, has been employed in the biological control of insect pests in several parts of the United States. Both the larvae and adults are predaceous, and although they live primarily on the ground, they frequently climb trees in search of caterpillars, grubs, and other immature forms of destructive insects. They are mainly nocturnal in habits and are often found in large numbers around lights feeding on other insects. In the areas where caterpillars of hawk moths are numerous, the beetles are found at night running about on the ground or climbing bushes in search of prey. During the day they are found under rocks and logs or in other secluded places and when disturbed give off a brown, bad smelling, and probably protective fluid from large anal glands.

Calosoma sycophanta, probably the most well-known species, was found to be an important predator of the gypsy-moth caterpillars (*Porthetria dispar*) in France, and, after the outbreaks of the gypsy and brown-tail moths (*Nygmia phaeorrhoea*) in the United States, the beetles were imported to aid in their control. The first specimens were received in 1905 from Sardinia, and between 1905 and 1910 4046 adults of this carabid were brought to the United States. Most of these were released in the field, with the result that they became an important factor in the natural control of the moths. Although originally released in the New England states, the beetles have spread and established themselves in adjacent areas.

The results obtained in New England were so promising that between 1913 and 1918 1000 adults were introduced into California. They were liberated in Sacramento for the brown-tail moth; on Angel Island, San Francisco Bay, for tent caterpillars; and in San Mateo County, for the California oak moth.

Unfortunately these beetles are general predators and thus do not confine their feeding activities to any particular insect species, a feature in their activity that has kept them

from being an outstanding example of biological control. However, their voracious feeding habits undoubtedly justify their important place among the insect predators that aid in the natural control of insect pests. Although largely unheeded, a number of our native species, especially in the western United States, help in the control of the white-lined sphinx (*Deilephila lineata*) which is often very abundant and injurious to a large variety of plants.

FEEDING HABITS

The larvae of *Calosoma* are very active when the weather is hot and feed by day and night. They usually attack the caterpillars from beneath or from the side, but if the caterpillars are hairy they pinch them between the segments. Even a newly hatched larva is able to kill a caterpillar of considerable size. The larvae eat the liquid and fatty parts of the caterpillars and often leave the meal before it is finished, thus destroying more caterpillars than they actually need. The larvae favor the pupae of butterflies, except those that are hidden in cocoons. However, there are records that cocoons of *Malacosoma americana* and *Malacosoma disstria* have been destroyed. Usually a larva makes a hole on the side of the pupa, between the segments, enlarges it, and then pushes the front part of its body inside. It leaves the pupa when there is virtually nothing left but a shell. While eating, the larva is well hidden beneath the old pupa cases. The entrance hole made by the larva is always irregular in outline and cannot be confused with holes made by parasites. Preference is given to the pupae of females. There are records (Burgess, 1911) stating that among the pupae killed by the larvae of *Calosoma sycophanta* 75 per cent were females. One larva of *Calosoma* as large as *sycophanta* or *scrutator* is able to kill about 50 caterpillars or 15 pupae between the time of hatching and pupation.

The adults of *Calosoma* seize the caterpillars in the middle of the back and easily kill them in a few seconds regardless of size. During the season one beetle can destroy

about 300 caterpillars. Actually some species, such as *Calosoma sycophanta*, which live from two to three years, destroy even more caterpillars. If another beetle is attacked, it is often seized by the neck between the occiput and pronotum, or, if it is a beetle with a soft abdomen, such as some species of the family Chrysomelidae, it is attacked from below. In captivity the beetles can also eat beef meat, but after a week or so they refuse to feed, and caterpillars must be given to them.

Apparently the species of *Calosoma* are not affected by the diseases from which some caterpillars often suffer. Experiments showed that *Calosoma sycophanta* was not affected by a disease of the gypsy moth known as "wilt."

Cannibalism among the larvae is not uncommon and, to a certain extent, reduces the number of larvae even when food is abundant.

The best-known species of the genus, *Calosoma sycophanta*, is, as is said above, more or less adapted to the life of the gypsy moth and is very active when the caterpillars of the gypsy moth are present. Most of the larvae hatch during the pupal stage of the moth. In spite of the fact that *sycophanta* attacks other caterpillars and pupae, it is never numerous in the regions where the gypsy moth is absent. Both larvae and adults are very good climbers; they mass on trunks of the trees under branches where the pupae of the gypsy moth are usually hidden and devour them on the spot. Occasionally they attack the imago also, mostly a female laying eggs.

Calosoma frigidum lives chiefly on *Heterocampa guttivitta* and other Lepidoptera that pupate on the ground. The larvae of *frigidum* are not good climbers and feed on pupae that are usually hidden in cells under leaf mold.

Calosoma calidum is also more terrestrial in habits; the larvae do not often climb but usually prey on caterpillars and pupae that stay on the ground. The adults, however, climb trees easily. Records show that they destroy cankerworms, cutworms, army worms, locusts, and Colorado potato beetles. The larvae of *Calosoma cancellatum* are also adapted to those insects that stay on the ground.

Calosoma scrutator and *haydeni*, on the contrary, feed on various caterpillars that live on trees and bushes, although there are indications that they are not such good climbers as is *Calosoma sycophanta*.

Calosoma externum is known to feed on locusts and army worms.

HISTORICAL ACCOUNT

The taxonomic study of *Calosoma* started as early as the middle of the eighteenth century. The oldest descriptions appeared in 1736, made by Réaumur in Paris; in those days the beetles were known under the general name of "scarabs." In 1758 Linnaeus described *sycophanta*, *inquisitor*, and some other species under the genus *Carabus*. In 1801 Weber subdivided the genus *Carabus* into two genera, *Carabus* and *Calosoma*, and chose *sycophanta* as the type of his new genus, *Calosoma*. In 1865 Motschulsky divided *Calosoma* into several genera, such as *Callistriga*, *Camedula*, *Callitropa*, *Caminara*, and *Charmosta*. A few were described by Kirby (1837), Géhin (1885), and Kolbe (1895). The genus *Callisthenes* Fischer appeared in 1822 (1820–1822). Lapouge (1927, 1929) divided *Calosoma* into two large groups: *Calosomines* and *Callistheniens*, and described a few new subgenera, such as *Callistenia* and *Isostenia*. Lapouge's descriptions are often long and confusing, and I agree with Jeannel (1940) in thinking that there is not sufficient ground for creating new subgenera.

In the United States, before the publication of LeConte's synoptic table (1878b), there had been only separate descriptions of different species scattered through the literature. LeConte's work contains the key to 25 species of *Calosoma* from the United States and Canada. He used as a main character for the determination of species the number of dilated and ventrally hairy segments of the male tarsi. The identification of females is rather difficult unless a series of examples with males is included.

The work of Bates in the "Biologia Centrali-Americana" (1881–1884) and his "Additions to the carabideous fauna of Mexico" (1891) deals only with Mexican species. Blatchley's "The Coleoptera or beetles of Indiana" (1910) includes a few species found in that state.

"The genus *Calosoma*" by Burgess and Collins (1917) is more of a biological study than a taxonomic work, but it has original descriptions and keys for 38 adult species and 16 larvae. The keys for adults were adapted from LeConte's table; 13 new species were included. The biological observations made by the authors on so many species are the most interesting among works of the kind.

Casey's publications, which appeared in 1893, 1897, 1913, 1914, and 1920, contain long descriptions of quite a number of new species and subspecies, and keys for certain groups of *Calosoma* and *Callisthenes*. However, most of his new species and subspecies are not recognized by many entomologists. I studied Casey's works and collections and admit that I often failed to find a difference between Casey's new species and others already described. I agree with Lindroth (1954), who said: "No more or perhaps even less than 20 per cent of Casey's species will prove valid or worthy of being preserved as subspecies." However, some of them are undoubtedly good, and there is no reason why they should be rejected arbitrarily, as has been done by some taxonomists (Jeannel) who distrusted everything described by Casey.

Quite recent work, which includes *Calosoma*, has been done by Hatch, "The beetles of the Pacific Northwest" (1953), but only local species are treated.

The most complete works on the taxonomy of *Calosoma* appeared in 1927 and 1928, written by Breuning, and in 1940, by Jeannel.

In Breuning's "Monographie der Gattung *Calosoma*" (1927, 1928a, and 1928b) the species of the entire world were treated, and 32 species from North America were recognized. Breuning divided all species into many subspecies and variations, placed as subspecies of *laeve* all large Mexican *Calosoma*, and as subspecies of *striatulum* six different species, all of which occur in adjacent, or even in the same, localities. In the key Breuning included only the specimens that he recognized as full species and divided the genus into 11 subgenera.

Jeannel in his work "Les calosomes" (1940) also included the species of the entire world, but he changed Breuning's division al-

most completely and divided *Calosoma* into 20 genera. Jeannel revived the genera described by Motschulsky (1865), Kolbe (1895), Apfelbeck (1918), and others. He paid a great deal of attention to the geographical distribution, chaetotaxy, and genitalia, the character of the genitalia being used as the most important one in the division of certain genera. Jeannel (1940) reduced all Casey's species to synonymy, but elevated to species some of Breuning's subspecies (*viridisulcatum*, *anthracinum*, *atrovirens*, *costipenne*, *diminutum*, *politum*, *parvicollis*, and others). He recognized 51 species from North America.

Jeannel's division of *Calosoma* into 20 genera seems to me not justifiable, especially in the case of the former *Blaptosoma* group, because it is based on differences of the genitalia only. Therefore I here change Jeannel's genera into subgenera of the genus *Calosoma*, except for *Microcallisthenes* which more properly belongs in the genus *Callisthenes*. I recognize 56 full species and seven subspecies of the genus *Calosoma*, and 16 species in the subgenus *Microcallisthenes* of the genus *Callisthenes*, which contains only two subgenera.

Short descriptions of each subgenus are given before the corresponding group.

The purpose of the present work is to provide a descriptive analysis of the North American *Calosoma* and *Callisthenes* and to make their determination as easy as possible. Because of the differences of opinion among various authors, the identification of certain *Calosoma* species is rather difficult, and the species of the *luxatus* group in the genus *Callisthenes* often cannot be determined if there are no types for comparison.

This paper is based largely on the material that I studied in the American Museum of Natural History; in the United States National Museum in Washington, D. C., where I also studied the Casey collections; in the Staten Island Museum of Arts and Sciences; in the Museum of Comparative Zoölogy, Cambridge, Massachusetts, where I saw the types in the LeConte and Fall collections; in the Academy of Natural Sciences of Philadelphia, where I saw the Horn collections with the type forms. In addition I studied the collections sent to me from the California Academy of Sciences, from the University of

California, from the University of Michigan, from Cornell University in Ithaca, from the Chicago Natural History Museum, from the British Museum (Natural History) in London, and the collections of Mr. J. W. McReynolds of St. Benedict's College, Atchison, Kansas.

DISTRIBUTION RECORDS

Most of the common types of American *Calosoma* are widely distributed throughout

the United States and in southern Canada. Some of them, such as *protractum*, *palmeri*, *semilaeve*, *simplex*, and all species of the genus *Callisthenes* (subgenus *Microcallisthenes*), have a restricted distribution covering from one to five or six states.

For these widely distributed and common species I thought it unnecessary to list all the localities in the United States and Canada where they had been collected. Only the states are mentioned. However, in the cases

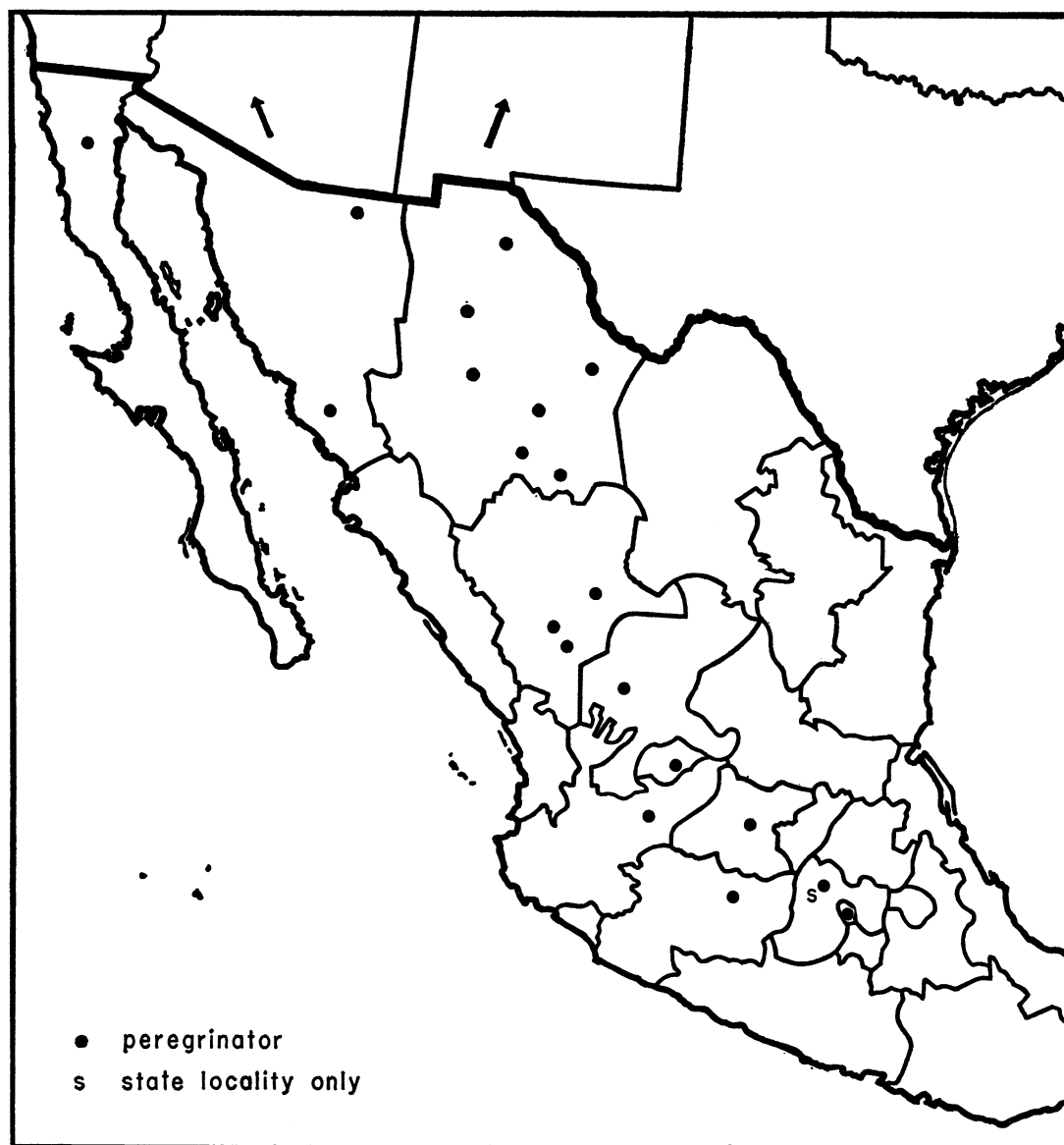


FIG. 1. Distribution of *Calosoma (Camedula) peregrinator* Guérin-Ménéville.

in which some of the species were described by one author as synonyms, by another as subspecies, and by a third as separate species, I considered it necessary to give all the records. For instance: *Prominens* and *parvicollis* were considered by Breuning (1927) as subspecies and by Jeannel (1940) as different species. Fall (1910) described *tristoides* as a new species, different from *triste*; Burgess and Collins (1917) also considered them to be different, while Breuning (1927) placed both species as subspecies of *affine*, and Jeannel (1940) as synonyms of *affine*.

In every case in which there was a difference of opinion in the literature, I list all the localities from which I had the opportunity to examine the beetles myself.

For Mexico all records are listed even for common species such as *peregrinator* (fig. 1), because the distribution of *Calosoma* in Mexico is less well known than that in the United States and because a few of the Mexican species are no doubt fairly rare. Probably, however, the majority of *Calosoma* in Mexico have a wider distribution than is indicated according to the present records and available material.

A total of 6527 specimens have been examined.

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THE GENERA *CALOSOMA* AND *CALLISTHENES* IN NORTH AMERICA

IN NORTH AMERICA, including Mexico, the genus *Calosoma* is represented by 12 subgenera; the genus *Callisthenes*, by one subgenus (*Microcallisthenes*).

Most of the beetles are large, seldom less than 11 to 12 mm., with a stout or elongated body. The color is black, with or without metallic luster, or dark brown, bronze, or green. The head is narrower than the pronotum, but may be stout; the eyes are rounded, often projecting, with one seta near each eye (the only exceptions are some species of the *luxatus* group in the subgenus *Microcallisthenes*, which may have from two to six setae near each eye). The sides of the head are margined from the clypeus to the eyes; on the sides of the clypeus and front there are elongated dimples, which almost disappear in the species of the subgenus *Carabomimus*. The front is usually punctate, often rugose or wrinkled, especially near the eyes, but may be also quite smooth; the punctures are either large and sparse, as in *angulatum*, *marginalis*, and *viridisulcatum*, or fine and dense, as in *peregrinator*, in almost all species of the subgenus *Chrysostigma*, and in *Microcallisthenes*. The occiput and clypeus are smooth or more finely punctured, even in the species with rough sculpture. The clypeus is more or less distinctly divided from the front and bears setae on the sides. The labrum is short and wide, slightly or strongly curved at the margin, with a notch in the middle or almost bifurcate, but never divided completely; it bears setae and pore punctures, is smooth or wrinkled. The mandibles are often stout and slightly or strongly arcuate on the tip, with a little serration or tooth on the right mandible, mostly rugose or strigose, and punctate in the creases, but quite a few species have smooth or only slightly strigose mandibles; the tip and inner edge are always smoother.

The gula is distinctly divided from the genae and is often wrinkled; it bears four setae on its anterior border. The mentum has large, often wrinkled or punctate lobes; the tooth of the mentum is usually pointed and varies in length: short in the subgenus *Calosoma*, long in the subgenus *Chrysostigma*,

with or without pore punctures. The maxillary palpi have the last segment of the same length and width as the preceding, or much shorter and wider, but never so wide as in some *Carabus*. The labial palpi have four setae on the second segment; the last segment varies in the same manner as in the maxillary palpi.

The antennae are filiform, short or long, but mostly reach the humeral angles. They are placed anterior to the eyes and have 11 segments. The first segment is larger and wider than the others, cylindrical or only slightly compressed, with or without a sharp edge, and bears one, very seldom two, setae. The second segment is very short, mostly slightly compressed, often with a sharp edge. The third segment is three or four times longer than the second, in all specimens more strongly compressed than the others and with a sharp edge, but the tip is cylindrical and bears setae; in the subgenus *Microcallisthenes* the third segment is strongly compressed almost to the extreme end. The fourth segment is compressed and edged in its basal part; the upper part is cylindrical and bears setae. Some species have almost cylindrical segments, and, as was noticed by Jeannel (1940), species that are closer to the genus *Carabus* have even the third segment hardly compressed. The first four segments are glabrous. Beginning with the fifth segment, the segments are pubescent, with yellow or light brown hair, but many species, not only in the subgenus *Microcallisthenes*, have elongated glabrous spots dividing the pubescent areas on the inner and outer sides; these spots, usually wide on the fifth and sixth segments, become narrower on the following segments and disappear, or remain in the form of a thin thread on the last segment.

The pronotum is wider than it is long, often twice as wide or more. Some species have an only slightly wider pronotum (*angulatum*). The widest part is mostly near the middle, but many (subgenus *Microcallisthenes*) have the widest part before the middle and some (subgenus *Blaptosoma*) behind the middle. The sides are evenly arcuate, or angulated

(subgenera *Carabosoma*, *Camegonia*, *Came-dula*). The side angles may be sharp (*angulatum*, *prominens*) or rounded (*marginalis*). At the basal part the sides of the pronotum are often flattened, in which case the lateral margin is much wider and more lifted at the base, but in many species it is thin from apex to base. In some specimens, only the front part of the pronotum has a distinct marginal bead (*discors*). Most of the species have one seta on each side of the pronotum, usually in the middle of the lateral margin. Some species (subgenus *Castrida*) have two setae, one seta in the middle and one near the hind angles, or two to three setae in the middle, and in the *luxatus* group of the subgenus *Microcallisthenes* three species have from five to eight or more setae. If the lateral margin is narrow, the hind angles of the pronotum are usually pointed or narrowly rounded. If the lateral margin is wider at the base, the hind angles are broadly rounded; they may extend slightly or rather notably behind the basal line. Nearly all species of the subgenus *Microcallisthenes* have narrowly rounded hind angles extending beyond the basal line. Many species have the pronotum narrowed behind or cordiform, with sides rounded only towards the apex, straighter posteriorly; the base is truncate or sinuate; the apex is usually margined, often having a thin, blue line along the marginal bead; this bead is wider in the middle. All species of the subgenus *Carabomimus* lack the marginal bead on the apex. The disk is either convex or flattened, in most specimens with dimples near the hind angles; however, quite a few species in the subgenus *Carabomimus* and some in the subgenus *Blaptosoma* have no dimples at all. The base and sides, often the apex, of the pronotum are punctate and rugose and always stronger than the disk, which is smooth, wrinkled, or more finely punctured, although some species have a very rough sculpture (*semilaeve*, some in the subgenus *Microcallisthenes*). On the other hand, almost all species in the subgenus *Blaptosoma* have a smooth pronotum. The median line of the pronotum is distinct in the species with smoother sculpture and often disappears in the rough examples. The scutellum is triangular, variable in size and sculpture, not only among the species but within them. But in the subgenus

Carabomimus, the scutellum as a rule is much wider than long.

The elytra are oblong-oval in most of the species, more elongated in the subgenus *Calilitropa*, or round-oval in the subgenus *Microcallisthenes* and some others. The humeral angles are mostly distinct in the species with well-developed wings and rounded in the wingless ones. The elytral margin near the humeri is serrate or even; the sides are more or less parallel or more rounded. In some specimens, and in the females more than in the males, the elytra are slightly wider towards the apex. The sculpture is variable. Usually each elytron has 16 striae and one short stria near the scutellum. The striae are mostly punctured, and the punctures are connected by lines. If the striae are deep, the interstices are convex. If the striae are fine and often obliterated towards the apex, the interstices are flat. Many species have scaly elytra, very often at the basal part only, closer towards the sides. Some species, such as *calidum*, *angulatum*, and *obsoletum*, have scaly elytra from base to the apex. These scales are not real scales, as in some Curculionidae, but are formed by transverse wrinkles of the interstices which connect the punctures of the adjacent striae; however, they may be rather deep and form tegulae as in some *Microcallisthenes*. Some species have a double row of punctures in each interstice (*discors*), and some have the number of striae reduced to seven (*viridisulcatum*). Many beetles have confused elytral striae or granulated elytra.

On the fourth, eighth, and twelfth interstices there are rows of punctures or foveae, not always present. They may be large, with the diameter of the same length as the width of the interstice, or may be smaller, with the length of the diameter less than the width of the interstice. They are shining, coppery, golden, metallic green, or bluish. Usually in the middle of each large fovea there is a small granule. The large foveae often break the interstices into a chain, which in some cases is slightly elevated (*tepidum*). Some species have additional short rows of foveae near the margin, and some have scattered, irregular punctures or dimples. Quite a few have no foveae. The elytral margin usually is rugose at the basal part. The epipleurae are wider

near the thorax and narrower near the sides of the abdomen.

The wings are absent in the subgenera *Microcallisthenes*, *Blaptosoma*, *Carabomimus*, and *Calopachys*, and reduced in *Paracalosoma*; all the other subgenera have well-developed wings. In the wingless species the metaepisternum is not longer than it is wide; in the others it is notably longer (figs. 70–88). Actually there are no wingless Carabidae; the remains of the inner wings can always be found (Darlington, 1936).

The ventral side is black, dark brown, metallic green, or bluish, with the proepisternum smooth, punctate, or slightly granulated, the prosternum mostly smooth, and the prosternal process also smooth or slightly wrinkled, with setae at the end. The mesosternum is rougher than the prosternum; the mesoepisternum is mostly punctate. The metaepisternum is also punctate, in some specimens with large, sparse punctures, or, as in the subgenus *Chrysostigma*, finely and densely punctate; some species (*sycophanta*) have the whole thorax densely punctured. The first and second abdominal segments are entirely punctate, or punctate at least on the sides, and the punctures are larger and deeper than on the following segments. The third, fourth, and fifth abdominal segments are punctate and wrinkled on the sides and in some specimens entirely (*angulatum*, *ampliator*). The last abdominal segment is mostly wrinkled and punctate throughout, more roughly at the apex and sides, in some specimens it is covered with short hair, either entirely, as in *peregrinator*, or only at the apex, as in the species of the subgenus *Calitropa*. Each abdominal segment bears setae, the number of which varies in different species or even individuals. As a rule the last abdominal segment bears eight setae on the apex, four on each side, but very often the number increases to 10, 12, or even 20 to 26, as in some species of the subgenera *Calodrepa*, *Blaptosoma*, and *Microcallisthenes*. In several specimens on the apex there are also additional setae in the second row, closer to the middle of the segment—two to four and even six. These setae are almost always present in the genus *Callisthenes* (subgenus *Microcallisthenes*) and in several species of the genus *Calosoma*. On each side of the last segment

there is always one separate seta which is seldom doubled. The fourth and fifth segments have usually two, four, or even six setae each, but in *Microcallisthenes* the number is often increased to six or more. The third abdominal segment has either two to four setae or, in addition to them, has also some shorter setae closer to the sides of the segment. These additional setae on the sides are present in some specimens of the subgenera *Blaptosoma*, *Carabomimus*, and *Chrysostigma*. All beetles of the subgenus *Microcallisthenes* and also *Calosoma* (*Calodrepa*) *sycophanta* and *wilcoxi* have numerous setae on the third segment. The second abdominal segment in all forms has numerous, short setae located in the area covered by the metatrochanter.

The legs are moderately long. The anterior and middle coxae are globular, with punctures and setae on the upper side. The metacoxae are plates and immovable; they divide the first abdominal segment in the middle. The trochanter of the anterior and middle legs is short and connate with the femur. The metatrochanter is large, oblong-oval, with the apical part rounded and free from the femur, reaching the third abdominal segment; in some specimens it bears one seta. The males of *granulatum* and *alternans* have an arcuate, pointed trochanter. The femora vary in size; the anterior are always the shorter and stouter, the posterior longer and more slender. They are grooved underneath for the reception of the tibiae and have four rows of punctures bearing setae. The tibiae are wider at the apex and bear spines or teeth, two large ones (spurs) and a row of smaller ones around the edge of the tip. The tibiae also have grooves and spines on the sides, usually in four rows, and in some specimens additional setae. The anterior tibiae are wider and shorter, the posterior longer and more slender. The anterior tibiae also have a wrinkled groove on the upper part. The middle tibiae in some species, especially in the subgenus *Castrida*, are strongly arcuate in the males, less so in the females. In addition to the usual four rows of spines they have ornamentation in the form of grooves and spines (a row of thick spines on the upper outer part) and in some species a brush of red hair on the tip. The hind tibiae are mostly

straight or slightly arcuate and have four rows of setae. Species of the subgenera *Castrida* and *Calosoma* (such as *Calosoma sycophanta*) have the tibiae finely punctate.

The tarsi are five-segmented in all Carabidae, the fifth segment having two claws. The first segment is the longest and the hind tarsi are longer and more slender. The segments of the anterior tarsi are more or less flattened, in the male dilated and with a dense brush underneath. These segments are shorter and broader in the species with arcuate tibiae. Most of the species have three segments, with a brush underneath; some have four or two. The upper side of the tarsi is smooth, shining, or finely punctate.

The penis is arcuate, narrowed towards the end, and has a rounded tip. It has an opening, or orificium, on the side which is covered by two thin lobes, and when it is open the inner armature is visible within. The inner armature may be easily pulled out for examination. The form of the penis and the inner armature, as was proved by Jeannel (1940) and other authors, is a good character for identification. In the majority of *Calosoma* and in all species of *Callisthenes* the inner armature of the penis has a hook at the end; in the subgenus *Carabomimus* it is thread-like or flag-like, and in the subgenus *Calopachys* it has a "button" at the end.

The genitalia of the females, which have not been described previously and not used for the classification of *Calosoma*, vary in different subgenera and even in different species, but less so than do those of the males. The chitinized part of the genitalia, which may be easily pulled out for examination, consists of a pair of leaf-like processes called gonapophyses, each with a more elongated, slightly triangular basal part, which is distinctly divided from the process (basal part of the genitalia). The leaf-like process is usually triangular, with a pointed or obtuse tip, but in some species it is in the form of a spoon (some species of the subgenera *Castrida* and *Camegonia*). Near the tip of the process there is an elongated or rounded furrow with two small setae at its apex, which are often so small and so close together that they seem to be one seta. Some species of the subgenera *Calosoma* and *Calodrepa* have longer setae, which may reach the tip of the process. The

base of the process has punctures bearing short hair, and its dorsal side is depressed, sometimes almost hollow, strigose and punctate, or smooth and in some species (subgenus *Calodrepa*) has a convexity in the middle, which divides the depression into two parts, like the main nerve of a leaf. The basal part of the genitalia, which is divided from the leaf-like process, consists of two elongated, chitinized plates or sclerites, each of which is convex dorsally, often sharply ridged, sometimes flattened, and on the apical part near the process has a row of spines. The inner sides of the sclerites are punctate, usually sparsely, all the punctures bearing short hairs. In some specimens there are punctures on the outer sides also, but they are scattered and fewer in number. In the subgenus *Carabomimus* the inner sides of the basal sclerites have long depressions, one on each side, in some specimens very distinct. Between the two basal sclerites of the genitalia there is a pouch or reservoir with two small, chitinized lobes on the sides (figs. 173-201).

The males differ from the females in external characters also. Usually they have more parallel elytra, a smoother last abdominal segment, more arcuate middle tibiae, and anterior tarsi with segments dilated and bearing a brush underneath.

SYSTEMATIC LIST OF SPECIES

Genus *Calosoma* Weber

Subgenus *Castrida* Motschulsky

alternans alternans Fabricius

alternans sayi Dejean

granulatum granulatum Perty

granulatum coxale Motschulsky

Subgenus *Calosoma* Weber

sycophanta Linnaeus

frigidum Kirby

Subgenus *Calodrepa* Motschulsky

splendidum Dejean

aurocinctum Chaudoir

scrutator Fabricius

wilcoxi LeConte

Subgenus *Carabosoma* Géhin

angulatum angulatum Chevrolat

angulatum angulicolle Chaudoir

Subgenus *Camegonia* Lapouge

marginalis Casey

prominens LeConte

parvicollis Fall

Subgenus *Camedula* Motschulsky
peregrinator Guérin-Méneville
eremicola Fall
sponsa Casey

Subgenus *Chrysostigma* Kirby
cancellatum Eschscholtz
tepidum LeConte
lepidum LeConte
calidum Fabricius
concreta Casey
obsoletum Say
ampliator Bates
affine Chaudoir
morrisoni Horn
semilaeve LeConte
simplex LeConte

Subgenus *Callitropa* Motschulsky
externum Say
macrum LeConte
protractum LeConte

Subgenus *Paracalosoma* Breuning
palmeri Horn

Subgenus *Blaptosoma* Géhin
viridisulcatum Chaudoir
haydeni haydeni Horn
haydeni puncticolle Bates
porosifrons Bates
atrovirens atrovirens Chaudoir
atrovirens obscurum Géhin
chihuahua, new species
laeve Dejean
anthracinum anthracinum Dejean
anthracinum micrignonum Bates

Subgenus *Carabomimus* Kolbe
orizabae Jeannel
gebieni Breuning
striatulum Chevrolat
striatipenne Chaudoir
laevigatum laevigatum Chaudoir
laevigatum hogei Breuning
politum Chaudoir
diminutum Bates
morelianum Bates
diguetti Lapouge
costipenne Chaudoir
cicatricosum Chaudoir
flohri Bates
depressicolle Chaudoir
altipeta Jeannel
asper Jeannel
bulleri Beheim and Breuning

Subgenus *Calopachys* Haurý
viridissimum Haurý
omilemum Bates
blaptoides Putzeys

Genus *Callisthenes* Fischer
 Subgenus *Microcallisthenes* Apfelbeck
subaeneus Chaudoir

moniliatus LeConte
wilkesi LeConte
latipennis Horn
dietzi Schaeffer
discors LeConte
schaefferi Breuning
placerus, new species
luxatus Say
striatius Hatch
lariversi Van Dyke
monticola Casey
subasperatus Schaeffer
pimelioides Walker
oregonus, new species
zimmermanni LeConte

KEY TO THE GENERA

Antennae beginning with the fifth segment, uniformly pubescent; if there are elongated, glabrous spots on the fifth and following segments, then metaepisternum is longer than wide and wings are well developed . . . *Calosoma* Weber

Antennae, beginning from the fifth segment, have distinct glabrous spots dividing the pubescent area on the outer and inner sides of each segment; metaepisternum is not longer than wide, and wings are absent *Callisthenes*¹ Fischer

KEY TO THE SUBGENERA² OF *Calosoma* OF NORTH AMERICA (CANADA, UNITED STATES, AND MEXICO)

1. Metaepisternum longer than wide (figs. 70-83), wings well developed; humeral angles mostly distinct. 2
- Metaepisternum not longer than wide (figs. 84-88), wings rudimentary or absent; humeral angles usually rounded 10
- 2(1). Pronotum with basal seta close to hind angles and with middle seta on the sides; tibiae, especially the front ones, besides usual grooves and spines, finely, densely punctate; metatrochanter of male strongly arcuate and pointed on apex
- *Calosoma* (*Castrida*) Motschulsky
- Pronotum without basal setae; tibiae, besides usual grooves and spines, smooth or with a few fine punctures; metatrochanter of male hardly arcuate, apex rounded. 3
- 3(2). Last segment of maxillary palpi of the same length as and hardly wider than

¹ Of the genus *Callisthenes*, only the subgenus *Microcallisthenes* is treated in the present paper, because it is the only one that occurs in the United States.

² The subgenera are described below in the order of the key.

- the preceding; tooth of mentum small, often blunt; ventral side metallic green or with a distinct green or bluish luster 4
- Last segment of maxillary palpi notably wider, often shorter than the preceding; tooth of mentum, with only a few exceptions, much longer, usually pointed; ventral side without or with a very faint metallic luster. 5
- 4(3). Femur black or dark brown, without metallic green, violet, or blue luster; elytra either brilliant green, often with a tint of red on the sides (but not the margin), and foveae small, or dark, almost black, with large coppery or green foveae *Calosoma (Calosoma)* Weber
- Femur reddish brown or dark brown, with metallic green, blue, or violet luster; elytra brilliant green or dark green; foveae inconspicuous or very small *Calosoma (Calodrepa)* Motschulsky
- 5(3). Pronotum with angulated or rather strongly arcuate sides and small, mostly pointed, hind angles (figs. 58, 60, 61); black beetles 6
- Pronotum with slightly arcuate sides, often flattened at the base; hind angles rounded (figs. 59, 65, 66); bronze, green, brown, or black species 9
- 6(5). Elytra elongated, with deep striae and convex, scaly interstices; pronotum narrower, about one and a half times as wide as long, sides strongly angulated *Calosoma (Carabosoma)* Géhin
- Elytra wider, striae mostly obliterated or rather fine towards apex; interstices flat, scaly at the basal part only; pronotum wider, nearly twice or more than twice as wide as long, with strongly or moderately angulated sides 7
- 7(6). Metatrochanter without setae; head either with sparse, large punctures and pronotum with rounded side angles, or head more finely and densely punctate and pronotum with strongly angulated sides (fig. 16) *Calosoma (Camegonia)* Motschulsky
- Metatrochanter usually bearing a seta; head finely, often densely, punctate; side angles of pronotum more rounded (fig. 58) 8
- 8(7). Pronotum with angulated or strongly arcuate sides and very small, pointed, hind angles (figs. 17, 18, 61); tooth of mentum small and pointed (fig. 69) *Calosoma (Camedula)* Motschulsky
- Pronotum with more rounded sides and rounded, though small, hind angles, (figs. 20, 24, 27); tooth of mentum either blunt or long and pointed (figs. 67, 68) *Calosoma (Chrysostigma)* Kirby (in part)
- 9(5). Head with sparse, large punctures; antennae, beginning with the fifth segment, uniformly pubescent; metaepisternum with large, sparse punctures *Calosoma (Callitropa)* Motschulsky
- Head finely and densely punctate; antennae mostly with elongated, glabrous spots on the fifth and sixth segments; metaepisternum with finer and denser punctations, except in *affine* and *ampliator*. *Calosoma (Chrysostigma)* Kirby (in part)
- 10(1). Pronotum with a distinct apical marginal bead 11
- Pronotum without apical marginal bead, or the bead is incomplete and visible on sides only 12
- 11(10). Pronotum not narrowed behind, with sides slightly arcuate; lateral margin notably wider at the base, except in *microgonum*; antennae hardly reaching the humeri; elytra smooth, with obliterated or fine striae and flat interstices *Calosoma (Blaptosoma)* Géhin (in part)
- Pronotum narrowed behind, with sides arcuate at the front and straighter posteriorly; lateral margin narrow from apex to base; antennae longer, reaching beyond the humeri; elytra either with deeply impressed striae and convex interstices or with obliterated striae and flat interstices *Calosoma (Calopachys)* Haury (in part)
- 12(10). Pronotum with lateral margin definitely wider at the base and with slightly arcuate sides; elytra smooth; inner armature of penis thread-like or flag-like (figs. 140-152) *Calosoma (Carabomimus)* Kolbe (in part)
- Pronotum with narrow lateral margin, not at all or hardly wider at the base. 13
- 13(12). Head at the front with very fine, sparse punctures and wrinkles; elytra smooth, with obliterated striae; inner armature of penis with a hook at the end (figs. 132-139) *Calosoma (Blaptosoma)* Géhin (in part)
- Head without punctation and wrinkles at front, in some near eyes only; if head is punctate or wrinkled at the front, then elytra have distinct striae 14
- 14(13). Pronotum not narrowed behind, with

- sides slightly arcuate; antennae short, hardly reaching the humeri . . . *Calosoma* (*Carabomimus*) Kolbe (in part)
- Pronotum narrowed behind, with sides arcuate at the front and straighter posteriorly; antennae longer, reaching beyond the humeri 15
- 15(14). Elytra slightly wider towards the apex, with rather fine, not punctate, striae and flat interstices; wings rudimentary. . . . *Calosoma* (*Paracalosoma*) Breuning
- Elytra with more or less parallel sides, striae punctured; if without punctations, then they are very deep and interstices are convex; wingless 16
- 16(15). Elytral striae either not punctured at the bottom and very deep, interstices convex, or obliterated towards apex, punctate at the basal part, interstices flat; inner armature of penis with a "button" at the end (figs. 153-154) *Calosoma* (*Calopachys*) Haury (in part)
- Elytral striae distinctly punctate from apex to base, interstices often convex; inner armature of penis thread-like or flag-like (figs. 140-152) *Calosoma* (*Carabomimus*) Kolbe (in part)

GENUS CALOSOMA WEBER

SUBGENUS CASTRIDA MOTSCHULSKY

Castrida MOTSCHULSKY, 1865, p. 300. Type: *Calosoma sayi* Dejean.

Callistriga MOTSCHULSKY, 1865, p. 307. Type: *Carabus retusum* Fabricius.

Calamata MOTSCHULSKY, 1865, p. 307. Type: *Calamata rugatum* Motschulsky.

Acampalita LAPOUGE, 1929, p. 9. Type: *Calosoma vagans* Dejean.

Catastriga LAPOUGE, 1929, p. 9. Type: *Calosoma trapezipenne* Chaudoir.

DESCRIPTION: Beetles with oblong-oval, convex elytra. Head usually punctate; labrum almost bifurcate or with a deep notch in the middle; tooth of mentum short, triangular, pointed; last segment of maxillary palpi wider than the preceding; antennae reaching the humeri, third segment strongly, second and base of the fourth slightly, compressed, beginning with fifth segment, antennae uniformly pubescent.

Pronotum wide, with sides evenly arcuate; lateral margin complete and with two setae on each side, one seta near the middle, the other close to hind angles, which are small and hardly extend beyond the basal line. Only one species of this subgenus (*galapo-*

geium, from the Galapagos Islands) has lost its hind setae.

Elytra with deep, distinct striae, convex and scaly interstices, and three distinct rows of large foveae on each elytron.

Ventral side smooth or finely punctate and wrinkled; metaepisternum with large, sparse punctures, longer than wide, wings well developed; last abdominal segment bearing six or eight, rarely 10, setae on the apex, but no additional ones in the middle; third, fourth, and fifth segments having two, sometimes four, setae each. Middle tibiae strongly arcuate, especially in the male, with a brush of setae on the inner side; hind tibiae straight or slightly arcuate; metatrochanter of male arcuate and pointed, except in some South American species, such as *vagans*, *antiquum*, and *retusum*; metatrochanter of female rounded, or slightly pointed, but not arcuate, usually without seta; anterior tarsi of male having two or three segments with a brush underneath, second segment with a depression on dorsal side, near the base. Some South American species are without depression. Tibiae and tarsi in both sexes very finely, but distinctly, punctate. Penis with a narrow and elongated tip, again with the exception of some South American species. Gonapophyses not leaf-like or nail-like, as in most other subgenera of *Calosoma*, but resembling the end of a spoon, rounded on the tip, with sides slightly arcuate, dorsal side impressed, ventral convex, punctate and with short hair at the base; near the tip of the process a small, rounded, or slightly elongated furrow containing two setae, which are mostly tiny, except in some forms of *alternans*. Basal part of the genitalia moderately or strongly convex, with punctures bearing long hair on the inner sides of sclerites (fig. 175). Some of the South American species have different genitalia.

The subgenus *Castrida* Motschulsky was described for *Calosoma sayi* Dejean because of the two hairy segments of the anterior tarsi of the male. Later Breuning (1927) united the two subgenera *Castrida* and *Callistriga* into one, under the name *Callistriga*. Jeannel (1940) showed that the name *Castrida* has page priority (though both were described in 1865), and, according to him, it is a separate genus with the following characters: basal

seta of pronotum present, seta on metatrochanter absent, middle tibiae arcuate, with a brush of hair, metaepisternum smooth, with a few large punctures. However, the basal seta on the pronotum is also to be found in some species of the subgenus *Microcallisthenes* of the genus *Callisthenes* (*pustulosus*, *pimelioides*, *monticola*, and *subasperatus*). Also the seta on the metatrochanter is not always absent. It is true that the majority of the beetles in this subgenus have no seta, but it is always possible to run across examples, especially in *sayi*, with a very long seta on the metatrochanter.

The subgenus *Castrida* includes 10 species, most of which are to be found only in South America. In the United States and in Mexico it is represented only by *alternans sayi* Dejean, and in southern Mexico occasionally by *granulatum coxale* Motschulsky.

The subgenus *Castrida* forms a very distinct group, which can be easily distinguished from other subgenera by the bronze color of the body, usually with metallic luster, by the deep, not confused striae of the elytra, with convex, scaly interstices and large foveae, by the presence of the basal seta on the pronotum, by the strongly arcuate middle tibiae, finely punctate tibiae and tarsi, arcuate hind trochanter of the male, and by the genitalia, especially those of the female. There are other *Calosoma* with similar characters, but they are not present together as in this group.

KEY TO THE SPECIES AND SUBSPECIES OF THE SUBGENUS *Castrida* MOTSCHULSKY

1. Second, sixth, and tenth interstices much narrower than adjacent ones; often the fourth, eighth, and twelfth interstices, bearing foveae, narrower also; anterior tarsi of male with three segments dilated and bearing a dense brush underneath. Length, 24–30 mm. 2
- Elytral interstices of equal width, or only the second, sixth, and tenth slightly narrower than the adjacent ones; anterior tarsi of male with two segments, bearing a dense brush underneath 3
- 2(1). Coppery or bronze beetles with green luster on pronotum and elytral margin; fourth, eighth, and twelfth interstices, bearing foveae, not, or only slightly, narrower than adjacent ones. Central part of South America. *granulatum granulatum* Perty

Dark bronze beetles; interstices bearing foveae usually narrower than adjacent ones. Mexico and northern South America *granulatum coxale* Motschulsky

- 3(1). Elytra reddish coppery or light bronze; pronotum often with strongly arcuate sides. Length, 20–27 mm. Antilles

. *alternans alternans* Fabricius

Dark bronze or black beetles; pronotum with only slightly arcuate sides. Length, 22–30 mm. United States and Mexico *alternans sayi* Dejean

Calosoma (*Castrida*) *alternans*

DESCRIPTION: Dark bronze, coppery, dark brown, or black species, with metallic luster. Head often with green luster near eyes, which are projecting; front wrinkled and punctate, clypeus and occiput with finer punctures; labrum curved at margin, smooth or wrinkled; mandibles deeply strigose and punctate; antennae not extending far beyond humeri.

Pronotum almost twice as wide as long, with the widest part in the middle; sides arcuate, in some specimens rather strongly so; hind angles small, hardly extending beyond basal line, rounded or as obtuse triangles; basal dimples distinct; lateral margin thin; apical marginal bead with a thin, metallic green line along the edge; disk wrinkled, rugose and punctate on base, in some specimens also on sides and apex; hind angles and sides often have green luster.

Elytra with distinct humeral angles and even or only slightly serrated margin near them; sides almost parallel, hardly wider towards apex; striae deep, regular, punctured, punctures connected by lines; interstices convex, with transverse wrinkles, connecting punctures of adjacent striae, making elytra scaly; foveae on fourth, eighth, and twelfth interstices large, metallic green or coppery, and breaking interstices into chains that in some specimens seem to be more elevated and wider than adjacent interstices (not all interstices equally wide); margin with a green luster.

Ventral side dark brown or black; propisternum smooth or slightly wrinkled, mesopisternum and metaepisternum, as well as first abdominal segment, having large, sparse punctures, following segments slightly wrinkled and finely punctate on sides. Tibiae

and tarsi, in addition to usual rows of punctures and setae, very finely, but distinctly, punctate, especially anterior tibiae and middle and hind tarsi. Males with strongly arcuate middle tibiae, with a brush of red hair on the tip; hind tibiae slightly arcuate. Females have less arcuate tibiae. Metatrochanter of male arcuate, with a pointed tip and, in most specimens, with no setae. Anterior tarsi of male having three segments dilated, but only the second one bearing a brush of hair beneath the whole segment; first segment with a brush on the apical part only, the basal part remaining glabrous. Among the large series of specimens examined, I have seen some with no brush at all, the ventral side as glabrous as the dorsal one, and some specimens with a brush on the second segment only. Penis with a narrow and pointed tip (fig. 89).

The two subspecies *alternans alternans* and *alternans sayi* are very similar, and often it is difficult to separate them. *Calosoma (Castrida) alternans alternans* Fabricius does not occur in North America and therefore is not included in this work except in the key. It is found in the Antilles, Cuba, Jamaica, and Puerto Rico. It is smaller than *sayi* and has coppery or reddish elytra and often a more arcuate pronotum.

***Calosoma (Castrida) alternans sayi* Dejean**

Figures 12, 75, 89, 175

Calosoma sayi DEJEAN, 1826, p. 198. Type: Eastern and southern states of North America.

Calosoma armata CASTELNAU, 1835, p. 156. Type: "Mexico."

Calosoma sayi abdominale GÉHIN, 1885, p. 58. Type: "Mexico."

Calosoma sayi virginica CASEY, 1897, p. 344. Type: Norfolk, Virginia.

This subspecies is usually larger than *alternans alternans*; length, 22 to 30 mm.; width, 9 to 12 mm. Black or greenish black, not so shining and with less arcuate sides of the pronotum.

DISTRIBUTION: More abundant in the eastern, central and southern states. Has been recorded from Alabama, Arizona, Arkansas, California, Florida, Georgia, Illinois, Iowa, Louisiana, Mississippi, New Jersey, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia. In Mexico it has been recorded

from Nuevo Leon: Monterey; Puebla: Mesa de San Diego; San Louis Potosi: Tamazunchale; Sinaloa: Mazatlan, Rosario; Tamaulipas: Mante; Oaxaca: Tehuantepec; Veracruz: Cotaxtla. According to Jeannel (1940) it has spread to the south of the Gulf of Tehuantepec and to the Antilles (Cuba and Haiti). Actually on Cuba and probably Haiti it is replaced by *alternans alternans*.

Breuning (1927) placed *sayi* as a subspecies of *alternans*, but Jeannel (1940) considered it to be a different species, found mostly in the United States and Mexico, while *alternans*, according to Jeannel, is found in South America and in the Antilles, except Cuba and Haiti.

Calosoma armata Castelnau is a synonym of *sayi*, as stated by Breuning (1927) and Jeannel (1940). Bates [1881 (1881-1884)] thought that *armata* was a different species that occurred in Mexico.

Calosoma sayi subsp. *virginica* Casey, said to be distinguishable from *sayi* by its slightly narrower form, is a synonym of *sayi*. I failed to find a difference between Casey's type of *virginica* and other specimens, except the usual infraspecific variations. As for the brush of the first anterior tarsi of the male which, according to Casey (1897), is whole in *virginica* and divided by a thin glabrous line in the western forms, this character is not a constant one. I have seen examples from different localities without the glabrous line on the first anterior tarsi.

Calosoma sayi var. *abdominale* Géhin, as proved by Breuning (1927) and Jeannel (1940), is also a synonym. Géhin (1885) described this form as having a smoother pronotum, stronger punctures on the elytra, and smoother interstices.

MATERIAL EXAMINED: One hundred and seventy-eight specimens.

Calosoma (Castrida) granulatum

This is principally a South American species which was placed by Breuning (1927) as a separate species, and by Jeannel (1940) as a subspecies of *alternans*. However, *granulatum* differs from *alternans* in the unequal width of the elytral interstices, the fourth, eighth, and twelfth often being narrower than the adjacent ones, and the second, sixth, and tenth much narrower, while in *alternans* the fourth,

eighth, and twelfth interstices are of the same width as the adjacent ones, and the second, sixth, and tenth are either slightly narrower or of equal width. The anterior tarsi of males have three segments dilated and with a brush underneath in *granulatum* and only two or fewer in *alternans*. Otherwise these species are much alike.

There are two subspecies, *granulatum granulatum* Perty and *granulatum coxale* Motschulsky. The first occurs only in South America (Brazil, Paraguay, and Uruguay) and therefore is not described here. The second is found mostly in northern South America, sometimes in Mexico, and in the Lesser Antilles.

Calosoma* (Castrida) *granulatum coxale
Motschulsky

Figure 90

Calosoma coxale MOTSCHULSKY, 1865, p. 307. Type: Venezuela. New name for *armatum* Reiche, 1842, p. 377; preoccupied by *armatum* Castelnau.

The subspecies *coxale* differs from *granulatum granulatum* in being of slightly smaller size, darker, not shining, color, without greenish luster on the head and pronotum, in the elytral interstices bearing foveae, which are usually narrower than the adjacent ones, while in *granulatum granulatum* they are of equal width or hardly narrower; in the third segment of the anterior tarsi of the male, which in *coxale* is partly covered by a brush of hair underneath and in *granulatum granulatum* is fully covered. Length, 20 to 26 mm.; width, 9 to 12 mm.

DISTRIBUTION: Antilles: St. Barthelemy, Martinique, Trinidad. Panama: Chiriqui. Venezuela: Caracas, Maracaibo. Colombia: La Garita. Ecuador. Peru: Tumbes. Mexico: Veracruz: Cordoba.

Actually *coxale* is a renaming of *armatum* Reiche (1842), which was preoccupied by Castelnau's species (1835) that happened to be a synonym of *sayi*.

MATERIAL EXAMINED: Twenty-five specimens.

SUBGENUS CALOSOMA WEBER

Calosoma WEBER, 1801, p. 20. Type: *Carabus sycophanta* Linnaeus.

Callipara MOTSCHULSKY, 1865, p. 309. Type: *Carabus sycophanta* Linnaeus.

Synocalosoma BREUNING, 1927, p. 144. Type: *Calosoma frigidum* Kirby.

Weber, who described the genus *Calosoma* in 1801, chose *sycophanta* as the type form. Later (1865) Motschulsky divided this genus into several genera, leaving in the genus *Calosoma* only one species (*inquisitor*), because the males had four segments of the anterior tarsi dilated, with a dense brush underneath. For *sycophanta*, which had only three segments with a brush on the ventral side of the segments, Motschulsky created a new genus (*Callipara*). Roeschke (1896) proved that *inquisitor* from Siberia and the Caucasus had, as had *sycophanta*, only three segments with a brush. For that reason Breuning (1927) and Jeannel (1940) considered *Callipara* to be a synonym of *Calosoma*.

The subgenus *Calosoma* is very similar to the subgenus *Calodrepa*, which was also described by Motschulsky as a different genus and included two species: *scrutator* from North America and *oceanicum* from Australia. Breuning (1927) united the two genera *Calosoma* and *Calodrepa* into one subgenus, *Calosoma*, in which he placed a number of the Old World species and four American species: *scrutator*, *splendidum*, *aurocinctum*, and *wilcoxi*. However, Jeannel (1940) excluded the subgenus *Calodrepa*, with its four American species, from the subgenus *Calosoma*, leaving in the latter the Old World species and one American species, *frigidum*. This species had been placed previously by Breuning in a new subgenus, *Synocalosoma*, described by him for this single species. The characters given by Breuning for this new subgenus were: more slender body, rougher elytral sculpture, and large foveae. But both *scrutator* and *wilcoxi* also have rough, scaly elytra, and *wilcoxi* is as slender as *frigidum*. As for the elytral foveae, the European *inquisitor* also has large foveae. Therefore I cannot but agree with Jeannel, who reduced *Synocalosoma* to a synonym of *Calosoma*.

In the United States we have two species: *sycophanta* Linnaeus, introduced from Europe, and *frigidum* Kirby. Although quite similar to the species of the subgenus *Calodrepa*, they differ from them in the following characters: legs, including the femur, without metallic green or bluish luster, *sycophanta* with the whole ventral side of the body finely

and densely punctate, *frigidum* with dark elytra and large foveae. The species of the subgenus *Calodrepa* have the legs, especially the femur, with green or bluish, metallic luster, the ventral side with large punctures, and the elytra green, with small foveae.

KEY TO THE SPECIES OF THE SUBGENUS
Calosoma WEBER

Elytra golden green, often with red luster on sides; foveae small and hardly visible; pronotum black on disk, blue towards sides. Length, 22–35 mm. Introduced from Europe, found in Massachusetts and New Hampshire
 *sycophanta* Linnaeus
 Dark brown, bronze, or black; elytral foveae large, metallic green, coppery, or golden. Length, 19–27 mm. Northern and eastern parts of the United States, and southern Canada
 *frigidum* Kirby

***Calosoma (Calosoma) sycophanta* Linnaeus**

Figures 71, 91, 92, 173

Carabus sycophanta LINNAEUS, 1758, p. 414.
Type: "Europe."

DESCRIPTION: Head black or very dark brown, with blue luster, rather densely punctate throughout, rugose near eyes and at the front; eyes moderately projecting; labrum almost bifurcated, rugose or wrinkled; mandibles rough, strongly strigose and punctate in creases, usually with arcuate and sharp tip; antennae reaching the humeri, but seldom extending beyond them, second segment slightly compressed, third more strongly so, fourth only slightly compressed at the base, fifth and sixth segments often having elongated, glabrous spots, which in some specimens reach the end of antennae, dividing the pubescent area.

Pronotum black, with definite blue or greenish blue luster towards the sides; twice or nearly twice as wide as long, with the widest part in the middle, narrower at base, sides strongly arcuate; hind angles small, pointed, slightly extending beyond basal line; lateral margin narrow and not always complete, disappearing at base; disk rugose or very wrinkled and punctate at base, sides, and apex, in some specimens throughout. Scutellum black, smooth or slightly wrinkled.

Elytra much wider than pronotum, with distinct humeri, parallel sides, and even margin; color brilliant green, with purple or

golden luster towards sides; striae deep, distinct, interstices convex and with transverse wrinkles; foveae, although small and of same color as elytra, conspicuous. Ventral side black or brownish black, and with blue luster, densely punctate and wrinkled throughout, more strongly on thorax, first two abdominal segments, and sides of the others; last abdominal segment in most specimens having six setae on apex, in some specimens up to eight (four or three on each side), no additional setae in the middle of the segment; fourth and fifth segments with two to four setae each and third segment with numerous setae; all pore punctures bearing setae very small, hardly visible when setae fall off. Legs including femur, black; metatrochanter very often without seta; middle tibiae of male arcuate, hind ones straight, female with slightly arcuate middle tibiae; tibiae and tarsi, especially middle and hind tarsi, sparsely, finely punctate. Penis large, strongly narrowed towards the end, with a more or less pointed tip (figs. 91, 92); gonapophyses wide at the base, narrowed towards the apex, with a rounded tip; not so wide as in *scrutator*, though approximately of the same form; furrow near the tip of gonapophyses deep, long, and bearing two distinct setae which do not quite reach the tip, base punctate and with short hair and dorsal side strigose, with a convexity in the middle. Basal sclerites of genitalia moderately or slightly convex, with pore punctures bearing short hair on inner sides of sclerites (fig. 173).

Length, 22–35 mm.; width, 10–17 mm.

DISTRIBUTION: Introduced into the United States from Europe, has been recorded from Massachusetts, Connecticut, New Hampshire, and Seattle, Washington. I have seen a total of 30 examples from all the above-mentioned states.

Calosoma sycophanta has many color variations, but because all are found in Europe, Asia, or Africa, they are not included in the synonymy. According to Breuning (1927), *nigro-cyaneum*, *marginatum*, and *azoreum* (Letzner) are synonyms; *cupreum* Letzner, *purpureo-aureum* Letzner, *smaragdum* Rossi, *purpuripennis* Reitter, *severum* Chaudoir, *solinfectedum* Jänichen, *rapax* Motschulsky, *corvina* Heller, *habelmanni* Schilsky, *anthracinum* Houlbert, and *prasinum*

Lapouge are color aberrations; *lapougei* Breuning is a variation; and *sycophanta himalayanum* Gestro is a subspecies.

Jeannel (1940) placed all these as synonyms, except *purpuripennis* Reitter, *prasinum* Lapouge, and *severum* Chaudoir which he considered to be subspecies; *himalayanum* Gestro, according to Jeannel (1940), is a full species.

The American *sycophanta*, which I have seen, does not differ from the typical European forms.

MATERIAL EXAMINED: Thirty specimens.

***Calosoma (Calosoma) frigidum* Kirby**

Figures 13, 70, 93, 174

Calosoma frigidum KIRBY, 1837, p. 19. Type: Drummond's Island, Canada.

Calosoma frigidum levettei CASEY, 1897, p. 344. Type: Indiana.

DESCRIPTION: Dark bronze, dark brown, or black, with metallic green or purple luster on ventral side of the body.

Head wrinkled and punctate, especially at the front and near eyes, which are projecting; labrum almost bifurcated; mandibles moderately strigose, not too rough; tooth of mentum short and pointed; last segment of maxillary palpi not longer, nor much wider, than the preceding; antennae long, extending beyond the humeri, third segment strongly compressed, the second and base of fourth less compressed; beginning with the fifth segment, antennae pubescent and elongated, glabrous spots present on the fifth, sixth, and often the following segments.

Pronotum about one and one-half or two times as wide as long, rather narrowed posteriorly, slightly cordiform; lateral margin narrow, incomplete, disappearing near hind angles, the latter small, pointed, slightly bent inward, hardly extending beyond basal line; usually one seta in the middle of lateral margin, but in some specimens two setae, both in the middle, one following the other; dimples at base small; disk deeply wrinkled and punctate, base and sides rugose, and usually sides, often also base, with a golden green or purple luster.

Elytra with distinct humeri and slightly serrated margin near them, often elytral margin metallic green or golden; elytra

mostly slightly wider towards apex; striae deep, punctate, interstices convex, with transverse wrinkles, connecting punctures of adjacent striae, at basal part towards sides, scaly; foveae large, coppery, golden, or metallic green, mostly of semicircular form, with a granule within, which is formed by the end of the adjoining upper tegulae.

Ventral side dark, with metallic luster; prosternum, mesosternum, and metasternum, as well as the sides of abdomen, finely, moderately densely punctate; last abdominal segment punctate and wrinkled in female, much smoother in male; number of setae on last and following segments as in *sycophanta*. Metatrochanter as a rule without seta, but some specimens with one or two setae, anterior tibiae with a deep, wrinkled furrow; middle tibiae of male slightly arcuate, those of female almost straight, hind tibiae straight in both sexes; anterior tarsi of male with four segments dilated and a brush underneath; penis rather narrowed towards the end, with a long pointed tip (fig. 93); gonapophyses more slender than in *sycophanta*, tip often more pointed, setae in the furrow almost reaching the tip of the process or going beyond it, dorsal side of gonapophyses with only traces of convexity in the middle. Basal sclerites of genitalia more convex than in *sycophanta* and, in addition to usual pore punctures bearing short hair, having a few longer setae, closer to the ridge (fig. 174).

Length, 19–22 mm.; width, 7.5–11.5 mm.

DISTRIBUTION: More common in southern Canada and northern part of the United States. Canada: Drummond's Island, Ontario, Quebec, and Nova Scotia. According to Lindroth (1955) also in Newfoundland, and according to Hatch (1953) in British Columbia. United States: Connecticut, Colorado, Georgia, Illinois, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Texas, Utah, and Wisconsin.

Casey's *levettei*, which he considered to be a subspecies, is a variation. It is a little more slender, black, with bluish elytral margin and foveae; it also has faint blue luster on the sides of the pronotum. Breuning (1927) and Jeannel (1940) reduced it to a synonym, and I quite agree with them.

Calosoma frigidum is easily distinguished by its dark, scaly elytra with large foveae. It cannot be confused with any species of the subgenus *Calodrepa*, because they all have green elytra and inconspicuous foveae. At first glance it may resemble *sayi*, but *sayi* belongs to the subgenus *Castrida*, which has an evenly arcuate pronotum with rounded hind angles and setae near them, while *frigidum* has the pronotum narrowed posteriorly and with small, pointed, hind angles destitute of setae; *sayi* has rather arcuate middle tibiae, *frigidum* has the middle tibiae almost straight.

Calosoma frigidum is a rather common insect, and I have seen large series of it in almost all museums that I visited.

MATERIAL EXAMINED: One hundred and twenty-five specimens.

SUBGENUS *CALODREPA* MOTSCHULSKY

Calodrepa MOTSCHULSKY, 1865, p. 310. Type: *Calosoma scrutator* Fabricius.

DESCRIPTIONS: Elytra metallic green or dark green, with distinct humeral angles. Head finely punctate and wrinkled (*scrutator*, *wilcoxi*), with denser punctation or with sparse, large punctures (*aurocinctum*); eyes strongly protuberant and with one seta near each; labrum rather curved, often almost bifurcated; tooth of mentum short, blunt; last segment of maxillary palpi a little wider and almost as long as the preceding; mandibles strigose, in some specimens rather rough; antennae of normal length, in some species (*wilcoxi*) long.

Scutellum triangular, variable in size, but not wider than long. Pronotum narrowed posteriorly, with sides strongly arcuate (*splendidum*, *aurocinctum*) or more evenly arcuate (*scrutator*, *wilcoxi*); lateral margin incomplete, not reaching the base, and having one seta in the middle; hind angles small, pointed, and often bent inward; disk smooth or wrinkled and finely punctate at base and sides, in some (*wilcoxi*) more strongly wrinkled, at base rugose, with larger punctures.

Elytra notably wider than pronotum, with distinct humeri and even or slightly serrated margin near them; *wilcoxi* with a notably serrated elytral margin; elytra not very convex and usually a little wider towards the

apex; striae deep, not confused, punctured; interstices convex, with transverse lines, deeper towards the sides, and basal part of elytra often scaly; the usual triple rows of foveae either inconspicuous or easily visible, although foveae are small.

Ventral side in all specimens with metallic luster; metaepisternum longer than wide and wings well developed; proepisternum, mesoepisternum, and metaepisternum either smooth, with a few punctures on the metaepisternum only, or more densely punctate (*wilcoxi*); middle tibiae strongly arcuate in male in all species except *wilcoxi*, hind ones straight or slightly arcuate; metatrochanter with or without seta; anterior tarsi of male with three or four segments dilated and a dense brush underneath; last abdominal segment bearing six to eight setae on apex, in some species more, even as many as 20 as in *scrutator*, side seta also doubled, but no additional setae in the middle of segment or close to the middle in any of the four species of this group. Fourth and fifth abdominal segments having mostly from two to four setae each, occasionally even six setae on one or on both segments. Third abdominal segment bearing two, four, or six setae in *aurocinctum* and *splendidum* and as many as 20 setae in *scrutator* and *wilcoxi*. The genitalia in both sexes are different in all four species and therefore are discussed under each species separately.

The subgenus *Calodrepa* was described by Motschulsky because of the arcuate middle and hind tibiae of *scrutator* and *oceanicum*, but *wilcoxi*, which fits very well in this subgenus, has only slightly arcuate middle tibiae.

As I mention above, Breuning (1927) reduced *Calodrepa* to a synonym of *Calosoma*. But in 1940 Jeannel redescribed *Calodrepa* as a separate genus for four American species: *scrutator* Fabricius, *wilcoxi* LeConte, *aurocinctum* Chaudoir, and *splendidum* Dejean. According to him the main differences between *Calosoma* and *Calodrepa* are: the punctation of the metaepisternum is smooth, with a few large punctures, in *Calodrepa* and densely punctate in *Calosoma*; the pronotum has evenly arcuate sides in *Calodrepa* and is narrowed behind in *Calosoma*; and the mesotibiae in *Calodrepa* have scarcely any brush of

hairs. The first two characters do not fit all species of this group, because *wilcoxi* often has a dense punctation on the metaepisternum and the punctures are not larger than in *frigidum* (placed by Jeannel in the subgenus *Calosoma*), and *aurocinctum* has the pronotum narrowed posteriorly as in the species of the subgenus *Calosoma*. Nevertheless the *Calodrepa* species form a separate group, and they are easily distinguished from the American species of *Calosoma* by the metallic luster on the femora.

KEY TO THE SPECIES OF THE SUBGENUS
Calodrepa MOTSCHULSKY

1. Elytral margin of same color as the whole elytra, green, or light brown, with green luster; tibiae and tarsi dark brown. Length, 21–28 mm. Haiti, Cuba, in the United States in Florida and Georgia *splendidum* Dejean
Elytral margin purple or golden green, elytra green; tibiae and tarsi reddish brown or dark brown 2
- 2(1). Pronotum metallic green, in some with slightly lighter margin; femur bluish green. Length, 22–30 mm. Mexico *aurocinctum* Chaudoir
Pronotum dark blue, olive green, or black, with purple or golden green side margin; femur reddish brown or darker, with bluish luster 3
- 3(2). Large beetles, 25–35 mm. Pronotum dark blue or violet, with broad purple or golden green margin; middle tibiae of male strongly arcuate and with a brush of reddish hair on apex. Found mostly in eastern part of the United States and Canada, also in Mexico *scrutator* Fabricius
Smaller, 17–22 mm. Pronotum black or dark olive green, with bluish luster; side margin narrow, purple or golden green; middle tibiae of male straight, or slightly arcuate, without red hair on apex. United States and Canada *wilcoxi* LeConte

Calosoma (*Calodrepa*) *splendidum* Dejean

Figures 74, 94

Calosoma splendidum DEJEAN, 1831, p. 558.
Type: "San Domingo, Haiti."

DESCRIPTION: Light vermilion-green or light reddish brown, with green luster. Head at the front with large, deep, and sparse punctures, near eyes rugulose and with denser punctation, clypeus finely, sparsely

punctate; parts of mouth and antennae light brown; labrum almost bifurcated or strongly curved, smooth or wrinkled; mandibles rather arcuate on the tip, deeply strigose; antennae normally long, reaching humeri, third segment distinctly, second and base of fourth slightly, compressed, beginning with the fifth, pubescent. Pronotum about one and a half times as wide as long, sides rather arcuate; lateral margin narrow and incomplete; hind angles small, pointed, not or only slightly extending beyond basal line; disk smooth or finely wrinkled, base and sides rugose and sparsely punctate, more roughly in the rather distinct basal dimples. Elytra with even or only slightly serrated margin, striae deep, distinct, punctured, with lines connecting punctures; interstices convex, smooth or with fine transverse wrinkles, becoming deeper at basal part towards sides; foveae inconspicuous. Ventral side of same metallic green, light color; mesoepisternum and metaepisternum having large, sparse punctures, sides of abdomen finely punctate and wrinkled; last abdominal segment bearing from eight to 16 setae at apex; third, fourth, and fifth segments having from two to four setae each, in some specimens, as in *wilcoxi*, *scrutator*, and species of the subgenus *Calosoma*, third segment with more than four setae. Metatrochanter devoid of setae; femur metallic green, tibiae and tarsi brown or dark brown and very finely punctate; middle tibiae strongly arcuate in male, less so in female; hind tibiae slightly arcuate in both sexes; anterior tarsi of male with three or four segments dilated and a dense brush underneath, in some specimens the fourth segment with only a bristle of hair; penis strongly narrowed towards the end (fig. 94); the female genitalia having the basal sclerites convex, with sparse punctures bearing short hair on the inner sides, the leaf-like process wide at the base, narrowed towards apex, with a rounded tip and a small, rounded furrow near the apex with two setae in it, which almost reach the tip of process; base of process very finely punctured and with short hair, and its dorsal side with two slight depressions, divided by a small convexity.

Length, 21–28 mm.; width, 11–14 mm.

DISTRIBUTION: Southern species recorded from Haiti and Cuba. Apparently at the be-

ginning of this century the species made its appearance in the United States and was recorded in Florida: Chokoloskee (Schaeffer, 1904), Key West (Burgess and Collins, 1917), and Georgia: Clarke County.

It is easy to distinguish *splendidum* from all other species of the same subgenus by the bright vermilion-green color, by the absence of reddish or golden color on the elytral margin, and by the genitalia.

MATERIAL EXAMINED: Twenty specimens.

Calosoma (Calodrepa) aurocinctum Chaudoir

Figures 14, 95, 176

Calosoma aurocinctum CHAUDOIR, 1850, p. 420. Type: "Mexico." New name for *splendidum* Perbosc, 1839, p. 261; preoccupied by *splendidum* Dejean.

DESCRIPTION: Bluish green. Head green, clypeus, part of the front, and margin near eyes black, parts of mouth and antennae dark brown, front with deep and sparse punctures and slightly wrinkled, dimples near eyes rugose and punctate; eyes black, not the usual yellowish or brown color, or at least with black spots, and rather prominent; labrum strongly curved or almost bifurcated, smooth or slightly wrinkled; mandibles moderately stout, rather strigose, slightly arcuate at the end; antennae reaching humeri or extending beyond them; third segment notably compressed, second segment and base of fourth very little compressed, fifth, sixth, and following segments uniformly pubescent, except for the very base of fifth segment and in some specimens the sixth.

Pronotum twice as wide as long, at base slightly narrowed, sides strongly arcuate, margin often incomplete; hind angles small, pointed, hardly extending beyond basal line, dimples near them clearly visible, disk smooth or slightly wrinkled, towards base rougher, base, apex, and in some specimens the sides with fine, sparse punctation.

Scutellum black, green, or spotted black and green.

Elytra bluish green or dark green, with thin purple or golden margin, slightly serrated or even near humeri; striae deep, distinct, punctate, punctures connected by lines, interstices convex, with thin, transverse wrinkles which are deeper at basal part, towards sides; foveae very small or absent.

Ventral side, including femur, bluish green, often femur almost blue, tibiae and tarsi black; metaepisternum with deep, sparse punctures; sides of abdomen slightly wrinkled, and in some examples with a few punctures; last abdominal segment bearing from eight to 14 setae on apex; fourth and fifth segments usually with two setae each, and the third segment with mostly four, sometimes two, setae; middle tibiae of male strongly, hind ones slightly, arcuate; female with only middle tibiae slightly arcuate; anterior tarsi of male with four segments dilated and a dense brush underneath; all tibiae and tarsi very finely punctate; penis strongly narrowed towards the end (fig. 95); gonapophyses more elongated and more triangular than in *splendidum*, tip rounded, furrow near it elongated and bearing two setae which reach or even extend beyond the tip of the process; the dorsal side of process smooth, hardly depressed, and also divided by a small convexity; basal sclerites of the genitalia as convex as in *splendidum*, but with a denser and rougher punctation (fig. 176).

Length, 22–30 mm.; width, 10–14 mm.

DISTRIBUTION: Mexico: Durango: Silla, Sierra de Durango. Nuevo Leon: Allende, Apodaca, Monterrey, Santiago. Morelos: Cuernavaca, Piramide. Oaxaca: Campeche, Salina Cruz. San Luis Potosi: Valles. Tamaulipas: Ciudad del Mante, Tampico, Victoria. Veracruz: Monte Morelos, Playa Vicente. Yucatan: Chuminopolis, Merida. According to Burgess and Collins (1917) also occurs in Brownsville, Texas.

This insect is common in Mexico and occupies the eastern, central, and southern parts of the country. It is readily distinguished from others in the subgenus by its bright green or bluish color, the large, sparse punctures on the head, the less scaly elytra, and the genitalia. However, among the series of examples I have found a few beetles with the head finely and densely punctate and a definite blue luster on the front, as in *scrutator*, the pronotum not green, but dark blue, with a wide green margin, and the legs reddish brown, the femora with a blue luster. I believe that Breuning (1927) mistook the variation *aurocinctum* for *scrutator*, because it has the legs and the pronotum of the same color, and the same punctation on the head,



FIG. 2. Distribution of *Calosoma (Calodrepa) aurocinctum* Chaudoir and *scrutator* Fabricius.

as in *scrutator*. This may be an example of character displacement, because in the localities where *scrutator* and *aurocinctum* overlap, as in Veracruz, both species are very different, but in southern Oaxaca and also in Yucatan, where apparently *scrutator* is absent, *aurocinctum* has tended to converge towards *scrutator*. At least some of the specimens that I have seen definitely acquired some characters of *scrutator*.

MATERIAL EXAMINED: Sixty-two specimens.

***Calosoma (Calodrepa) scrutator* Fabricius**

Figures 73, 96, 97, 177, 178

Carabus scrutator FABRICIUS, 1775, p. 239. Type: Virginia.

DESCRIPTION: Head black, with golden green spots near eyes and a blue or violet luster around them; smooth or very finely wrinkled and with extremely fine punctures, but in dimples near eyes rugose; parts of mouth and antennae brown or reddish brown; labrum more or less strongly curved, smooth

or wrinkled; mandibles stout, often rather arcuate and pointed at tip, heavily strigose, but in some examples almost smooth; antennae reaching the humeri, third segment notably compressed; beginning with the fifth segment, antennae pubescent but often fifth and sixth, rarely other segments, having elongated, glabrous spots, which divide the pubescent area.

Pronotum short and very wide, twice as wide as long, or wider, sides evenly arcuate, hind angles small, hardly projecting beyond the basal line; lateral margin a little wider and more lifted at base, basal dimples distinct; disk usually finely wrinkled at the base and sides rugose, at apex with a few fine punctures, in some also on the sides; top of the disk dark blue or black, sides, base, and apex with a golden green or purplish margin.

Scutellum dark brown, black, or dark blue.

Elytra metallic green or dark green, with purple margin, mostly serrated near humeri, but often quite even; slightly broader towards apex; striae deep, punctate, punctures connected by lines, interstices convex, with transverse lines which connect punctures of adjacent striae, making elytra scaly; the triple rows of foveae clearly visible, though foveae small and of the same color as elytra.

Proepisternum, mesoepisternum, metaepisternum, and sides of abdomen, or in some specimens the whole abdomen, green or purplish, other parts of ventral side, including legs, brown, femur with blue luster, tibiae and tarsi brown or reddish brown; whole ventral side wrinkled, in addition mesoepisternum and metaepisternum sparsely punctured; first and second abdominal segments with a denser punctation, and a large part of the other segments finely punctate, mostly on sides; last abdominal segment very often bearing as many as 16 and, in some specimens even 20, setae on the apex; some examples also with two setae on the sides, instead of the usual one seta; fourth and fifth segments with two to six setae each and the third segment with numerous setae. Metatrochanter either without setae or with one seta, in some specimens even with two setae; both sexes with middle tibiae arcuate, hind tibiae only slightly so and more strongly in male; in addition male with a brush of red hair on the tip of middle tibiae; anterior tarsi of male with four segments dilated and a dense brush

underneath, middle and hind tarsi with fine, sparse punctures. Penis narrowed towards the end in the form of the neck of a bottle (fig. 96); leaf-like process very wide at the base and with a rounded tip, often punctate not only at the base of the process, as in most *Calosoma*, but also towards edges; furrow near the tip elongated and bearing two setae which reach the tip of the process; dorsal side of process strigose or smooth, with a distinct convexity in the middle; basal sclerites of genitalia moderately or slightly convex, the inner sides with large, sparse punctures bearing short hair, in some specimens more densely punctate, rougher than in *aurocinctum* or *splendidum* (fig. 177).

Length, 25–35 mm.; width, 11–16 mm.

DISTRIBUTION: More abundant in the eastern part of the United States, but recorded from the entire country, also from southern Canada, Mexico, and some parts of South America. Canada: Ontario; Quebec, Montreal. United States: Alabama, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Missouri, Mississippi, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Texas, and Virginia. Mexico: Chihuahua; Oaxaca; Veracruz: Tuxpan, Playa Vicente. Guatemala. Venezuela.

Breuning (1927) mistook *aurocinctum* for the Mexican *scrutator*, but evidently the specimens he had were the variation of *aurocinctum*, because *scrutator* from Mexico does not differ from *scrutator* of the United States, with the exception of some examples which have the same bluish color of the elytra as in *aurocinctum*. *Calosoma scrutator* seldom varies in color, but may be dark or light. Some examples, however, collected in Utah, in California, and in Oaxaca (northern part?), have dark blue elytra, with a green margin, and a brilliant green margin on the pronotum. The bluish color is more common in *aurocinctum* than in *scrutator*.

According to Jeannel (1940) *scrutator* has no seta on the metatrochanter, but this is an error; 40 per cent have one seta, some of the beetles even have two setae.

This species is very abundant on the east coast of the United States. It can be easily

distinguished from the other species of the subgenus by its large size, the dark green color of the elytra, and the wide purple or golden margin of the pronotum. It is similar to *wilcoxi*, but it is larger, has different genitalia, and the males have a brush of red hair on the tip of the middle tibiae, which *wilcoxi* has not; also the middle tibiae of *wilcoxi* are almost straight.

MATERIAL EXAMINED: Two hundred specimens.

***Calosoma (Calodrepa) wilcoxi* LeConte**

Figures 15, 72, 98, 179

Calosoma wilcoxi LECONTE, 1848, p. 446, pl. 2. Type: "United States."

DESCRIPTION: Dark green or bronze green. Head dark green or black, with green luster and often golden or purplish spots near eyes; finely and densely punctate throughout or even rugose at the front and near eyes; clypeus smooth or with a few fine punctures; mandibles strongly arcuate at the end, strigose; labrum curved at the margin, smooth or wrinkled; antennae long, extending beyond humeri, third segment strongly compressed, second and base of fourth segments only slightly so; pubescent, beginning with fifth segment.

Pronotum twice as wide as long, sides evenly arcuate, with a thin, incomplete margin; hind angles small, slightly extending beyond the basal line; basal dimples distinct; disk wrinkled and sparsely punctate, with larger punctures at base, in some specimens also on sides and apex; color dark green or black; lateral margin usually purplish, golden, or light green.

Scutellum mostly black. Elytra hardly convex, dark green or metallic green, with purple or golden margin, serrated near the humeri; in many specimens elytra wider towards apex; striae deep, not confused, punctate, and with lines connecting punctures; interstices convex, with transverse, deep wrinkles which unite punctures of adjacent striae and make elytra scaly, on basal part, towards sides; foveae present, though not very distinct.

Ventral side golden green, legs brown, femur often with blue luster; proepisternum finely punctate and wrinkled, mesoepisternum and metaepisternum with large, but rather fine punctures; often metaepisternum

moderately densely punctate and wrinkled, but in some specimens smooth, with only sparse punctures at base (actually this character varies greatly and can hardly be regarded as a good one for identification); sides of abdomen or almost the whole abdomen wrinkled and punctate; last abdominal segment bearing up to eight setae on the apex; fourth and fifth segments with mostly two, in some specimens four, setae each, but the third segment with quite a number. Metatrochanter bearing one seta; middle tibiae slightly arcuate in male, almost straight in female, hind ones straight in both sexes; anterior tarsi of male with four segments dilated and a dense brush underneath; penis wide, narrowed towards the end (fig. 98); gonapophyses more slender than in all other species of the subgenus, triangular, with a pointed tip, smooth, with a deep furrow near the tip of the process and two long setae which reach beyond the tip; dorsal side of the process without, or with feeble traces of, convexity in the middle. Basal sclerites of genitalia moderately convex, smooth, and in addition to the usual punctures with short hair, having longer setae, closer to the ridge (fig. 179).

Length, 17–22 mm.; width, 7–11 mm.

DISTRIBUTION: From southern Canada to Texas, more abundant in the eastern States. Canada: Ontario, Quebec. United States: Arkansas, California, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Missouri, Nebraska, New Jersey, New York, Ohio, Pennsylvania, and Texas. Apparently this species does not penetrate to Mexico and has never been recorded in South America.

This species is most similar to *scrutator*, but is smaller and has almost straight middle tibiae. It is not rare, as was acknowledged by LeConte, and is rather abundant in the eastern part of the country.

MATERIAL EXAMINED: One hundred and fifty specimens.

SUBGENUS CARABOSOMA GÉHIN

Carabosoma GÉHIN, 1885, p. 32. Type: *Calosoma angulatum* Chevrolat.

DESCRIPTION: The subgenus *Carabosoma* differs from the other closely related subgenera with angulated pronotum, in the narrow, elongated body, deeply punctate striae

and convex, scaly interstices on the elytra, strongly angulated, narrow pronotum, and uniformly pubescent antennae, beginning with the fifth segment. Description of the only species is given below.

The two forms included in this group (*angulatum angulatum* and *angulatum angulicolle*) are quite similar, the latter occurring only in South America, the former mostly in Mexico, occasionally in the United States.

Carabosoma was first described by Géhin for *angulatum* Chevrolat. Later Breuning (1927) included in this subgenus *peregrinator*, *glabratum*, *affine*, *triste*, *obsoletum*, *semilaeve*, and *simplex*. He united them in one subgenus because of the short and wide last segment of the maxillary palpi, the single seta in the middle of the side margin of the pronotum, the feebly sculptured mandibles, straight tibiae, and other, minor characters. However, all these species are very different from the type form, and only *peregrinator* has an angulated pronotum. In 1940 Jeannel excluded them all and left in this subgenus only one species, *angulatum*.

KEY TO THE SUBSPECIES OF *angulatum* OF THE
SUBGENUS *Carabosoma* GÉHIN

Side angles of pronotum rather pointed; elytral sculpture not scaly. Length, 25 to 33 mm. Mexico (common), southwestern United States (rare) . . . *angulatum angulatum* Chevrolat

Side angles of pronotum more rounded; elytral sculpture rougher, interstices scaly from apex to base; size smaller, less than 30 mm. South America . . . *angulatum angulicolle* Chaudoir

Calosoma (Carabosoma) angulatum angulatum
Chevrolat

Figures 60, 99, 180

Calosoma angulatum CHEVROLAT, 1834, fasc. 2. Type: Boca del Monte, Veracruz.

Calosoma forreri GÉHIN, 1885, p. 64. Type: Arizona.

Calosoma uniforme GÉHIN, 1885, p. 63. Type: Mazatlan, Mexico.

DESCRIPTION: Body elongated, black, often with metallic green or bluish luster at the base of pronotum and elytral margin, in some specimens pronotum with bluish luster and green elytral margin. Head with large, sparse punctures at the front, confluent near eyes, clypeus with fine punctures and wrinkles, in some specimens smooth; eyes projecting;

labrum moderately or slightly curved at the margin, smooth or wrinkled; mandibles strigose at basal part, towards apex smooth; tooth of mentum moderately long and pointed; antennae long, usually reaching beyond the humeri, not quite one-half of the length of the body, second, third, and base of fourth segments compressed, beginning with fifth segment, uniformly pubescent.

Pronotum narrowed at the base, in its widest part in the middle hardly one and a half times as wide as long; strongly angulated with sharp side angles; lateral margin narrow and with a seta in the middle, close to side angles; hind angles small, pointed, extending very little beyond the basal line; apex, sides, and especially base with large, deep punctures, often scattered punctures also around median line; disk very finely wrinkled, in most examples the median line crossed by thin wrinkles but some individuals with a smooth disk (fig. 60).

Scutellum triangular, usually of small size. Elytra elongated, with parallel sides, elytral margin serrated, in some specimens only slightly so; striae deep, distinct, interstices convex, with transverse wrinkles connecting punctures of adjacent striae (scaly); smoother specimens having scaly elytra at basal part only; foveae inconspicuous, if present then usually on the fourth interstices.

Ventral side black, smooth or wrinkled, shining; metaepisternum, first abdominal segment, and sides of the following segments with large, sparse punctures; last abdominal segment bearing up to eight setae on apex, four on each side, but often with six or even fewer setae; no additional seta closer to the middle of the segment; third, fourth, and fifth segments have usually two, in some specimens four, setae each; second segment with numerous setae. Penis wide, slightly narrowed towards the end, tip broadly rounded (fig. 99); gonapophyses more or less slender, triangular, with narrowly rounded or pointed tip; furrow near the tip elongated and with two moderately long setae which almost reach the tip of the process; base of leaf-like process with large punctures bearing short hair, its dorsal side impressed and with a slight convexity in the middle. Basal sclerites of genitalia convex, mostly with

sharp ridge, the inner sides with coarse punctures and short hair (fig. 180).

Length, 25–33 mm.; width, 9–12 mm.

DISTRIBUTION: Mexico: Different localities in Jalisco, Mexico, Morelos, Nayarit, Nuevo Leon, Puebla, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, and Veracruz. Probably occurs in other states also but seems to be more numerous in the north-western part of Mexico. In the United States it has been recorded from Arizona, California, New Mexico, and Texas, but is rare. According to Jeannel (1940) it occurs also in Honduras and Guatemala. Most of the specimens that I have examined were from Mexico; only one came from the United States.

Calosoma uniforme Géhin (type from Mazatlan, Mexico) is said to differ in its dull appearance, but I quite agree with Breuning (1928a) and Jeannel (1940) that it is a synonym of *angulatum angulatum*, because in the number of specimens examined there are both shining and quite dull examples. Géhin's *forreri*, as proved by Jeannel, also is a synonym.

Calosoma angulatum angulicolle is a South American subspecies and therefore not described in this work. It is quite similar to *angulatum angulatum* but is smaller, with elytra scaly from base to the apex, less pointed hind angles of the pronotum, and dull appearance.

MATERIAL EXAMINED: Four hundred and fifty specimens.

SUBGENUS CAMEGONIA LAPOUGE

Camegonia LAPOUGE, 1924, p. 38. Type: *Calosoma prominens* LeConte.

DESCRIPTION: Black, moderately convex. Head with large, sparse punctures or finely, densely punctate; eyes moderately projecting; tooth of the mentum triangular, small, and with side pores; last segment of maxillary palpi shorter and wider than the preceding; antennae normally long, reaching the humeri and a little beyond; second segment slightly compressed, third and base of the fourth segment strongly so.

Pronotum with angulated sides and sharp side angles (*prominens*, *parvicollis*) or with rounded side angles (*marginalis*); hind angles small, pointed, bent inward, pressed closely

to the body; disk wrinkled but never very rough, at the base often with sparse punctures; only one seta near side angles in the middle of the pronotum.

Elytra oblong-oval, wider than in the subgenus *Carabosoma*, with fine striae, mostly obliterated towards apex; interstices flat, at the basal part with transverse wrinkles or sparse, deep creases (*marginalis*); elytral margin serrated.

Ventral side smooth, with large, sparse punctures on the metaepisternum and first and second abdominal segments, the other segments smooth or finely punctured; last abdominal segment bearing usually eight, in some specimens 10, setae on apex, one seta on each side of the segment and, in most cases, no additional setae in the middle of the segment; third, fourth, and fifth segments with two to four setae each (*marginalis* and *parvicollis*); pore punctures bearing setae are very fine (if the setae fall off it is scarcely possible to see the pore punctures). In *prominens* the fourth and fifth segments have no setae at all. Episternum of metathorax longer than wide and wings well developed. Legs normally long, metatrochanter without seta, middle tibiae usually slightly arcuate, hind ones straight; anterior tarsi of male with three segments dilated and a dense brush underneath. Penis stout as in *prominens*, or thinner and slender as in *parvicollis*; inner armature with a hook at the end. Female genitalia very different from those of the other subgenera. Leaf-like process very rounded on the tip in *marginalis* and *prominens* and more pointed in *parvicollis*, the furrow near the tip often rounded or oval, with two tiny setae; sides of the process more or less straight, not arcuate as in the majority of *Calosoma*. Basal part of genitalia moderately or hardly convex; on the inner sides the sclerites with punctures bearing short hair, in some specimens with a few punctures on the outer sides also (figs. 181, 182).

This subgenus is close to the subgenus *Camedula* but differs in the absence of a seta on the metatrochanter and in the apically rounded gonapophyses of the female genitalia. In addition, *prominens* and *parvicollis* differ in the sharper side angles of the pronotum, which are more rounded in the

species of *Camedula* and in *marginalis*, the latter differing by having large punctures on the head, while the species of *Camedula* have the head finely and densely punctate.

The subgenus *Camegonia* is also similar to the subgenus *Carabosoma*, but the latter has the elytra with deep striae and convex, scaly interstices, while the species of *Camegonia* have finely punctate striae and flat interstices.

In Breuning's key (1927) the difference between the two subgenera is based on the middle tibiae, which are slightly arcuate in *Camegonia* and straight in *Carabosoma*. However, this character is not constant, many specimens in the subgenus *Camegonia* having absolutely straight middle tibiae. There are three species in this subgenus: *prominens* LeConte, *parvicollis* Fall, and *marginalis* Casey.

KEY TO THE SPECIES OF THE SUBGENUS
Camegonia MOTSCHULSKY

1. Elytra at basal part with sparse, large punctures connected by deep creases, striae fine or obliterated; side angles of pronotum more or less rounded; head with large, sparse punctures. Length, 23 to 32 mm. Southwestern part of the United States and northern Mexico *marginalis* Casey
- Elytra at basal part scaly, striae distinctly punctured; side angles of pronotum pointed; head more densely punctured . 2
- 2(1). Head finely, densely punctate; fourth and fifth abdominal segments with two or four setae each; smaller beetles, length, 21 to 28 mm. Southwestern part of the United States and Mexico . . . *parvicollis* Fall
- Head with larger punctures; the fourth and fifth abdominal segments without setae; larger, length, 24 to 34 mm. Southwestern part of the United States, mostly Arizona, and Mexico *prominens* LeConte

***Calosoma (Camegonia) marginalis* Casey**

Figures 58, 62, 103, 104

Calosoma marginalis CASEY, 1897, p. 340. Type: "Arizona?"

Calosoma (Camegonia) lecontei CSIKI, 1927, p. 21. Type: New Braunfels, Texas. New name for *lugubre* LeConte, 1853, p. 400; preoccupied by *lugubre* Motschulsky.

DESCRIPTION: Black, shining, often with green luster on the head, sides of pronotum, elytral margin, and foveae.

Head with large, sparse punctures at the front, rugose and punctate near eyes, and with a few punctures on sides of clypeus; number of punctures varying from two or three to dozens; eyes projecting, labrum moderately curved; mandibles usually stout, rugose, and often punctate in creases; antennae reaching the humeri and uniformly pubescent, beginning with the fifth segment.

Pronotum with angulated sides, but angles obtuse; in its widest place in the middle pronotum twice wider than long; hind angles small, triangular, with distinct dimples near them; lateral margin narrow; disk finely wrinkled, base rugose, in some specimens with a few punctures near hind angles.

Elytra with more or less parallel sides, or a little wider towards apex; humeral angles distinct, margin near them even or slightly serrated; striae very fine, almost obliterated, formed by minute punctures or by fine lines; interstices flat. I have seen only one beetle with slightly convex interstices, with chain-like elevations on the fourth, eighth, and twelfth interstices, and with larger, deeper foveae than are usually found in *marginalis*. On the basal part of elytra large, sparse punctures connected by very deep creases; foveae, when present, clearly visible because of the green luster, but shallow and small.

Ventral side black, smooth, metaepisternum and first and second abdominal segments with large, sparse punctures; last abdominal segment finely punctate and wrinkled, and in addition to the usual setae on the apex in some specimens with two setae, closer to the middle of the segment; third, fourth, and fifth segments having two setae each, and more finely punctate and wrinkled; middle tibiae of male, in some males also the hind tibiae, slightly arcuate; middle and hind tarsi with sparse, minute punctures. Penis moderately narrowed towards the end, a little arcuate and with a rounded tip (figs. 103, 104); gonapophyses broadly rounded on the apex, with more or less parallel sides, as in *prominens*, smooth and very finely punctate at the base, dorsal side smooth or finely strigose.

Length, 23–32 mm.; width, 9.5–13 mm.

DISTRIBUTION: Western and southern states. Colorado, Nebraska, New Mexico, Kansas, Oklahoma, and Texas. Mexico:

Chihuahua: Samalayuca; Nuevo Leon: Alende, Apodaca, Monterrey, Santiago; Morelos: Cuernavaca; Tamaulipas: El Mante, Nuevo Laredo.

Breuning (1928a) changed the name *lugubre* LeConte to *lecontei* because the name was preoccupied by *lugubre* Motschulsky, a European and Asiatic species, a synonym of *denticolle*. However, he failed to use the earlier name *marginalis* Casey (1897), which he put as a synonym of *lecontei* (*lugubre*).

Unfortunately the type of *marginalis* Casey is not typical of the species; it has no deep punctures on the head, although rugulose towards the eyes, and no creases at the base of the elytra, but has a few scattered punctures. The metatrochanter bears two setae, while other beetles of this subgenus have no setae. In large series it is possible to find examples with only two punctures, or even one puncture, on the head, but usually this species has more than a dozen scattered punctures.

Calosoma (Camegonia) marginalis differs from the other species of the subgenus in the large, sparse punctures on the head, in the deep creases at the base of the elytra, in the usually clearly visible foveae, in the light green luster on the elytral margin, and in the obtuse side angles of the pronotum. Both *parvicollis* and *prominens* have the head more densely punctate than *marginalis*, the base of the elytra scaly, the foveae mostly inconspicuous, and the side angles of the pronotum sharp.

MATERIAL EXAMINED: Five hundred and forty-eight specimens.

***Calosoma (Camegonia) prominens* LeConte**

Figures 19, 63, 105, 106, 181, 182

Calosoma prominens LECONTE, 1853, p. 400. Type: Pimas, California. New name for *angulatum* LeConte, 1851, p. 199; preoccupied by *angulatum* Chevrolat.

DESCRIPTION: Black, often with green luster in the punctures of head and base of pronotum. Head with large, moderately dense punctures, confluent near eyes, in some specimens with denser punctations and deeper wrinkles at the front; labrum strongly curved, mostly wrinkled; mandibles stout, a little arcuate at tip, strigose and punctate, in some rather rough; antennae reaching the

humeri, pubescent, beginning with fifth segment, seldom with glabrous spots dividing the pubescent area.

Pronotum with strongly angulated sides and sharp side angles; in the widest part in the middle twice wider than long; hind angles small, more or less pointed; lateral margin narrow; disk wrinkled, on apex with a few punctures, base punctate and rugose, sides wrinkled and often sparsely punctate.

Elytra slightly wider towards apex, humeri distinct, margin near them serrated; striae punctured, obliterated towards apex; interstices flat, at basal part scaly (with transverse wrinkles connecting punctures of the adjacent striae); foveae inconspicuous.

Ventral side brown or black, prosternum smooth, metaepisternum and coxae with large, sparse punctures; abdomen completely finely punctate and wrinkled, sides more roughly punctured; the last abdominal segment also more coarsely punctured and bearing eight or 10 setae on the apex, but no additional ones in the middle of the segment; third, fourth, and fifth segments with no setae at all, which is unusual in *Calosoma*; middle tibiae of male slightly arcuate; middle and hind tarsi very finely punctate. Penis stout, moderately narrowed towards the end, tip broadly rounded (figs. 105, 106); gonapophyses with a rounded tip, more or less straight sides, finely punctured at the base, as in *marginalis* (figs. 181, 182).

Length, 24–34 mm.; width, 9.5–15 mm.

DISTRIBUTION: Only in the southwestern United States and northern Mexico. Arizona: Cochise County: Douglas, San Bernardino Ranch; Graham County: Thatcher; Maricopa County: Higley, Phoenix; Pima County: Santa Catalina Mountains, Tucson; Yavapai County: Jerome; and undoubtedly other localities. New Mexico: Albuquerque and Coolidge. Mexico: Baja California; Sonora: Agua Zarca, Carbo, El Oasis, Hermosillo, Navojoa, and Obregon. According to LeConte (1853), it occurs in California.

This is a common beetle in the southwestern United States. It is similar to *parvicollis*, but is large, has a wider pronotum, different genitalia, and no setae on the fourth and fifth abdominal segments.

MATERIAL EXAMINED: Four hundred and eighty-three specimens.

***Calosoma (Camegonia) parvicollis* Fall**

Figures 16, 78, 100, 101

Calosoma parvicollis FALL, 1910, p. 90. Type: Pasadena, California.*Calosoma clemens* CASEY, 1914, p. 32. Type: Las Vegas, Nevada.*Calosoma pertinax* CASEY, 1920, p. 163. Type: Albuquerque, New Mexico.

DESCRIPTION: Black, some with a faint bluish luster at the base of the pronotum and elytral margin near the humeri.

Head moderately densely and more finely punctate than in *prominens*, also wrinkled at the front and rugose near eyes; clypeus with finer punctations; eyes projecting; labrum often almost bifurcated; mandibles slender, arcuate at the tip, strigose, in some specimens also punctate; antennae reaching the humeri, pubescent, beginning with fifth segment, but often with glabrous spots on fifth and sixth segments.

Pronotum with strongly angulated sides and sharp side angles, about one and a half times as wide as long in the widest place in the middle, but notably narrower than in *prominens*; hind angles small, pointed; lateral margin narrow; disk wrinkled, especially at the base and sides where it is also punctured, some specimens also having the apex punctured.

Elytra a little wider towards the apex, with distinct humeri and serrated margin near them; striae finely punctate, with larger punctures at basal part; interstices flat, at base scaly; foveae inconspicuous.

Ventral side black or dark brown; proepisternum smooth or with a few punctures, metaepisternum and first abdominal segment with large, sparse punctures, following segments finely wrinkled and punctate, smoother than in *prominens*; last segment usually with eight setae on the apex, but no additional ones in the middle; third, fourth, and fifth segments with two setae each. Middle tibiae of male almost straight, seldom slightly arcuate; middle and hind tarsi in both sexes finely punctured. Penis narrow, with elongated tip (figs. 100, 101); gonapophyses triangular, with the tip more pointed than in *prominens* and *marginalis*, although still rounded, not so sharp as in many other *Calosoma*, base of the process distinctly punctured and its dorsal side strigose.

Length, 20–28 mm.; width, 8–12 mm.

DISTRIBUTION: Southwestern part of the United States and northern Mexico; more abundant in California. Arizona: Maricopa County: Phoenix; Yuma County: Ehrenberg, Welton; Santa Rita Mountains. California: Imperial County: Brawley; Inyo County: Furnace Creek in Death Valley, Independence, Lone Pine, Olancho; Kern County: Mojave; Los Angeles County: Pasadena, Palms; Mono County; Monterey County: Camp Roberts; Riverside County: Blythe, Indio, Rancho Mirage; San Bernardino County: Needles; Santa Catalina Island. Nevada: Las Vegas. New Mexico: Albuquerque, Deming. Utah: Emery County: Green River; Utah County: Lookout, Provo, Snow. Mexico: Baja California; Sonora: La Choya, Puerto Libertad.

There is no doubt that the list of localities is not complete. This species is common in southwestern United States and northern Mexico. It resembles *prominens*, but differs in being of more slender form, having a narrower pronotum, finer punctuation on the head (though not so fine as in *peregrinator* and other species of the subgenus *Camedula*), fine sculpture of the abdominal segments, with two setae on the third, fourth, and fifth segments, and in the genitalia of both sexes. As a rule *prominens* is larger than *parvicollis*, but even small examples are readily distinguishable. Although *parvicollis* is more numerous in California and *prominens* is more abundant in Arizona, both species occur in some of the same localities in Arizona, New Mexico, and Mexico.

Breuning (1927) placed *parvicollis* as a subspecies of *prominens*; Jeannel (1940) proved that it was not the same species.

I failed to find any distinct difference between Casey's *clemens* and *pertinax* and *parvicollis*, and I agree with the action of Breuning (1928a) and Jeannel (1940) in placing them as synonyms of *parvicollis*.

MATERIAL EXAMINED: Three hundred and forty-five specimens.

SUBGENUS **CAMEDULA** MOTSCHULSKY

Camedula MOTSCHULSKY, 1865, p. 303. Type: *Calosoma glabratum* Dejean.

Acamegonia LAPOUGE, 1924, p. 38. Type: *Calosoma glabratum* Dejean.

DESCRIPTION: The subgenus *Camedula* is similar to the subgenera *Carabosoma* and *Camegonia*. Head finely, densely punctate and wrinkled. Pronotum with angulated sides, but side angles more rounded, in some specimens pronotum only strongly arcuate; disk finely, densely punctate and wrinkled. Elytra with distinct humeri and serrated margin near them; striae finely punctured, often obliterated towards apex; interstices flat, scaly closer to base; foveae inconspicuous. Ventral side with punctures on the sides, metaepisternum with moderately large, sparse punctures; last abdominal segment wrinkled and punctate, roughly in *peregrinator*, finely in *eremicola* and *sponsa*, usually with eight, sometimes 10, setae on the apex, but no additional ones in the middle; third, fourth, and fifth segments mostly with two setae each, all pore punctures very fine. Legs normal, metatrochanter bearing one seta; anterior tarsi of male with three segments dilated, having a dense brush underneath. Penis stout in *peregrinator*, more slender in *eremicola* and *sponsa*; gonapophyses triangular, with arcuate or slightly curved sides, base punctate and with short hair, tip narrowly rounded or pointed, furrow near it elongated, mostly deep and bearing two tiny setae, dorsal side of the process deeply strigose. Basal part of genitalia, as usual, punctate and with short hair on the inner sides of sclerites, in some specimens with a few punctures on the outer side also (figs. 183, 184).

The subgenus *Camedula* was described by Motschulsky (1865), with *glabratum* Dejean as type. Later Breuning (1927) changed the type to *rufipenne* Dejean (according to him the only species in this subgenus). Jeannel (1940) considered that *rufipenne* did not fit in this subgenus, and he left there the following species: *glabratum* Dejean, *peregrinator* Guérin-Méneville, *eremicola* Fall, and *haydeni* Horn. The last-named is an apterous species and fits much better in the subgenus *Blaptosoma*, where it had been placed previously by Breuning (1927). Actually, Jeannel (1940) considered *Camedula* to be a different genus, with three subgenera: *Camedula*, *Carabosoma*, and *Camegonia*. These subgenera are similar, consisting of beetles with an angulated pronotum with small,

pointed hind angles bent inward, one seta near the side angles of the pronotum, flat elytral interstices, black color, and other common characters. *Camedula* is more like *Camegonia* but differs in having much finer punctuation of the head, in the presence of a seta on the metatrochanter, and in the genitalia, especially those of the females.

In the United States and Mexico I recognize the following species: *eremicola* Fall, *sponsa* Casey, and *peregrinator* Guérin-Méneville; *glabratum* Dejean is a South American species, and *haydeni* Horn, as I say above, belongs in the subgenus *Blaptosoma*.

KEY TO THE SPECIES OF THE SUBGENUS *Camedula* MOTSCHULSKY

1. Larger beetles, length, 23 to 33 mm.; last abdominal segment of female with short erect hair, rather punctate and wrinkled, in male without hair, but also rather rough. . . . *peregrinator* Guérin-Méneville
Smaller, 16 to 19 mm.; last abdominal segment of female glabrous and smoother, in male also without hair but much smoother 2
- 2(1). Head and pronotum densely punctate and wrinkled; elytra at basal part scaly; stouter form. California, Colorado *eremicola* Fall
Head finely and sparsely punctate, pronotum nearly smooth or finely wrinkled; elytra towards base finely wrinkled; more slender form. Utah, Arizona, California *sponsa* Casey

Calosoma (Camedula) peregrinator Guérin-Méneville

Figures 61, 64, 69, 107, 183

Calosoma peregrinator GUÉRIN-MÉNEVILLE, 1844, p. 255. Type: "Mexico."

Calosoma carbonatum LECONTE, 1862, p. 53. Type: New Mexico.

Calosoma affine BATES (not Chaudoir), 1881 (1881-1884), p. 21. Type: "Mexico."

Calosoma peregrinator ingens CASEY, 1913, p. 62. Type: San Diego, California.

Calosoma peregrinator amplipennis CASEY, 1913, p. 62. Type: New Mexico or southern Colorado.

Calosoma subgracilis CASEY, 1913, p. 63. Type locality unrecorded.

Calosoma apacheana CASEY, 1913, p. 63. Type: Arizona.

DESCRIPTION: Black, shining, often with faint greenish luster near eyes, base of pronotum and elytral margin near humeri.

Head densely and finely punctate, often also wrinkled, more strongly near eyes and at the front; eyes moderately projecting, labrum curved at margin and wrinkled; mandibles stout, strigose and punctate; antennae short, but reaching the humeri, second and especially the third and base of fourth segments compressed, pubescent, beginning with the fifth segment, but often with elongated, glabrous spots on fifth, sixth, and in some specimens on following, segments.

Pronotum about one and a half times as wide as long, sides angulated, but tip of the angles rounded, not acute as in *prominens* or *angulatum*, some examples having the sides only strongly arcuate; hind angles small, pointed, often bent inward, dimples near them not very deep; lateral margin thin; disk wrinkled, in some specimens rather strongly, and very finely punctate; base, sides, and in some specimens parts of the apex, with stronger punctation.

Elytra with more or less parallel sides, slightly convex; striae finely punctured, almost completely obliterated towards apex; some specimens having a stronger punctation; interstices flat and with very fine, irregular, transverse wrinkles, deeper at the basal part, where elytra seem to be scaly; foveae inconspicuous or visible only because of the faint green luster.

Ventral side brownish black; proepisternum smooth, often with green luster, mesoepisternum and metaepisternum with large, sparse punctures; first abdominal segment strongly punctured, the other segments wrinkled and finely punctate; the last segment very roughly wrinkled and with coarser punctures, often rugose, in females the punctures bearing erect hair that covers the entire segment. Legs moderately long, metatrochanter with one seta; middle and hind tarsi very finely, sparsely punctured. Penis narrowed towards the end, slightly arcuate, tip hardly bent, and broadly rounded (fig. 107); gonapophyses with a pointed tip (fig. 183).

Length, 23–33 mm.; width, 10–13 mm.

DISTRIBUTION: Southwestern United States and Mexico. Arizona, California, Colorado, New Mexico, and Texas. Mexico: Baja California: La Cienega; Aguascalientes in the same state; Chihuahua: Catarinas, Gran Morelos, Madera, Samalayuca, Santa Bar-

bara, north of Meoqui, Valle de Olivos; Durango: Durango, Nombre de Dios, San Juan del Rio; Federal District: Guadalupe; Guanajuato: San Miguel Allende; Jalisco: Guadalajara; Nayarit: Torreon; Nuevo Leon: Monterrey, Santiago; Mexico: Chapingo; Michoacan: Morelia; Sonora: Hermosillo, Naco, east of Cananea; Zacatecas: Guadalupe.

Calosoma (Camedula) peregrinator is easily distinguished from the other species with angulated pronotum by the fine punctation of the head, the very rough sculpture of the last abdominal segment, with erect hair in the female, and rather wide penis with rounded tip. The two other species of the subgenus (*eremicola* and *sponsa*) are much smaller, have the last abdominal segment smoother, hairless in the female; the penis is also different.

Calosoma carbonatum LeConte, as proved by Horn (1883), Bates [1881 (1881–1884)], and others, is a synonym of *peregrinator*. LeConte (1862) described *carbonatum* as a new species from the United States, unaware of the Mexican form *peregrinator* described previously.

Casey (1913) thought that *carbonatum* was a subspecies of *peregrinator*; he probably did not see the type of *carbonatum*, which I have examined and found to be identical to *peregrinator*.

Calosoma affine Bates, according to Breuning (1928a), is also a synonym of *peregrinator*, but *affine* Chaudoir is a synonym of *triste* LeConte.

Calosoma peregrinator subsp. *ingens* Casey is nothing but a synonym; the characters given (shorter and broader body, more elongated mandibles, sparser punctation on the ventral side) are common variations found throughout the species. In fact the single example in Casey's collection has a denser, not sparser, punctation.

Calosoma peregrinator subsp. *amplipennis* Casey is another variation of *peregrinator* distinguished by its shorter and broader elytra, bluish green, clearly visible foveae, and rather wide pronotum. I have seen examples like this from Durango and Sonora and from Tucson, Arizona. Casey's type is from either New Mexico or southern Colorado.

The type of *Calosoma apacheana* Casey is a rather remarkable example of *peregrinator*. It

is more slender and smaller than the usual *peregrinator*, with narrower and strongly arcuate, not angulated pronotum, the elytral striae punctate from apex to base, seldom obliterated towards the apex. I have seen examples of this variation, principally from Arizona but a few from New Mexico (Chaves) and Texas (Hudspeth County). Casey's type is from Arizona. In Mexico, where the variations of *peregrinator* are more often found, specimens similar to *apacheana* have been collected in Sonora, Durango, Chihuahua, and Aguascalientes. Although *apacheana* and *amplipennis* are synonyms of *peregrinator*, they are different from the typical *peregrinator* and must be mentioned.

Calosoma subgracilis Casey, considered by Breuning (1928a) to be a synonym of *parvicollis*, is a synonym of *peregrinator*, according to Jeannel (1940), with which I agree.

MATERIAL EXAMINED: Five hundred and four specimens.

***Calosoma (Camedula) eremicola* Fall**

Figures 17, 108

Calosoma eremicola FALL, 1910, p. 91. Type: San Clemente Island, California.

Calosoma rugosipennis SCHAEFFER, 1911, p. 113. Type: California.

Calosoma hospes CASEY, 1913, p. 45. Type: Coronado, California.

Acamegonia peregrinator incerta LAPOUGE, 1924, p. 38. Type: Baja California.

DESCRIPTION: Black, resembling *peregrinator*, but much smaller. Head rather densely punctate throughout, rugose or wrinkled at the front and near eyes, clypeus punctate and wrinkled; mandibles arcuate at the top, deeply strigose and punctate; eyes moderately projecting; antennae short, but reaching the humeri, third segment notably compressed, second and base of fourth segments slightly so, pubescent, beginning with the fifth segment, but with elongated glabrous spots on fifth, sixth, and often seventh segments.

Pronotum angulated, but sides more rounded than in *peregrinator*, although females seem to have more acute angles; in its widest place in the middle pronotum twice as wide as long; hind angles small, triangular, base sinuate; lateral margin narrow, sculpture on the disk smoother than on the head;

finely densely punctate and wrinkled, at base and sides rougher.

Elytra notably wider than the head and pronotum; also slightly wider towards apex; striae distinct, punctured, with finer punctuation, or obliterated towards apex; interstices flat, at basal part scaly (with deep, transverse creases); foveae inconspicuous.

Ventral side brown; proepisternum smooth, metaepisternum, first abdominal segment, and sides of the other segments rather coarsely, not densely, punctate; legs moderately long, middle tibiae of male slightly arcuate; penis slender, with a narrow tip, inner armature long (fig. 108); gonapophyses as in *peregrinator*, but stouter and with more rounded tip.

Length, 16–19 mm.; width, 8–10 mm.

DISTRIBUTION: California: Coronado Beach in San Diego, San Clemente Island near San Diego, Santa Catalina Island. New Mexico: Faywood. Mexico: Baja California: Ensenada.

Although resembling *peregrinator*, this species is not a subspecies of the latter, but a distinct species, as proved by Jeannel (1940). It differs from *peregrinator* in its smaller size, genitalia, absence of hair on the last abdominal segment of the females, and other characters. The character given for *eremicola* by Jeannel (1940), of the scarcely angulated pronotum, is not typical, as some examples have an angulated pronotum. As with *peregrinator*, examples with hardly angulated sides of the pronotum, as in the variation *apacheana*, are common.

Calosoma rugosipennis Schaeffer (one male from California) is a synonym of *eremicola*. Schaeffer himself (1911) considered the two forms to be much alike. Jeannel (1940) placed *rugosipennis* as a synonym of *parvicollis*.

Calosoma peregrinator subsp. *incerta* Lapouge, also from California, is, as was proved by Breuning (1928a), a synonym of *eremicola*.

Calosoma hospes Casey is very much like *eremicola*, but the antennae in the female are a little longer than in *eremicola* and the pronotum is slightly smoother. However, these are the only differences that I could see in the two forms (male and female) in Casey's collection, and I agree with Jeannel (1940) in placing *hospes* as a synonym of *eremicola*.

MATERIAL EXAMINED: Twenty-four specimens.

***Calosoma (Camedula) sponsa* Casey**

Figures 18, 109, 184

Calosoma sponsa CASEY, 1897, p. 340. Type: Utah.

Calosoma parviceps CASEY, 1897, p. 341. Type: Arizona.

DESCRIPTIONS: These forms are more slender and smoother than *eremicola*. *Calosoma sponsa* has the head finely and sparsely punctate and wrinkled, pronotum much narrower than in *eremicola*, about one and one-half times as wide as long in its widest place in the middle, disk smooth, with a few punctures at the base, elytra narrower, with fine striae, at the basal part with fine, transverse wrinkles instead of deep creases as in *eremicola*. Ventral side also smoother, metaepisternum and abdominal segments except the last one sparsely punctate; penis long, with a small tip (fig. 109); gonapophyses as in *peregrinator*, but a little smoother, the process more slender than in *eremicola* and the tip more pointed (fig. 184).

Length, 16–19 mm.; width, 7–8.5 mm.

DISTRIBUTION: Southwestern parts of the United States. Arizona; California: Independence and Big Pine; Nevada: Churchill County, Esmeralda County, Mineral County, and Pilot Mountains; Utah.

Calosoma (Camedula) sponsa is not a variation of *peregrinator* as proposed by Jeannel (1940), but is a much smaller, smoother species, with the last abdominal segment not rugose, but finely wrinkled and punctate, and this segment not hairy in the females; the penis is also different, with a more slender tip.

It is also doubtful that it is a subspecies of *glabratum*, a South American species, which is much more like *peregrinator* than *sponsa*. *Calosoma glabratum* is larger than *sponsa*; the last abdominal segment has coarse punctures and short hair on the sides of the segment, closer to the apex; and the penis is as in *peregrinator*. Breuning (1928a) considered both *peregrinator* and *sponsa* as subspecies of *glabratum*.

The type of *parviceps* Casey, from Arizona, though very like typical *sponsa*, has a denser punctation on the head and pronotum;

the base of the pronotum distinctly punctured, with a few punctures also on the sides and apex; finely wrinkled disk; and the elytral striae finely but more distinctly punctate than in most *sponsa*, the interstices with transverse wrinkles at the basal part. Otherwise it is like *sponsa* and, I think, a synonym. I have seen the types of both of Casey's forms, as well as 27 specimens from California and Utah. Among these are rough examples similar to Casey's *parviceps* and smooth ones similar to his *sponsa*.

MATERIAL EXAMINED: Twenty-nine specimens.

SUBGENUS **CHRYSOSTIGMA** KIRBY

Chrysostigma KIRBY, 1837, p. 19. Type: *Carabus calidum* Fabricius.

Tapinosthenes KOLBE, 1895, p. 56. Type: *Calosoma cancellatum* Eschscholtz.

Lyperostenia LAPOUGE, 1929, p. 3. Type: *Calosoma triste* LeConte.

This subgenus contains 11 species which may be divided into two groups: (1) *calidum* Fabricius, with deep elytral striae, convex interstices, large, coppery or metallic green foveae, and even or slightly serrated elytral margin; and (2) *affine*, with fine striae, flat interstices, and finer elytral sculpture, but strongly serrated margin near the humeral angles and small foveae. However, these species have many common characters so that they belong in one subgenus.

Head and pronotum usually finely, densely punctate and often wrinkled; eyes moderately projecting, with one seta near each; last segment of maxillary palpi shorter and wider than the preceding; tooth of the mentum moderately long and pointed, except in *ampliator* and *affine*; antennae short or long, but always reaching the humeri, beginning with fifth segment, uniformly pubescent or with elongated glabrous spots on fifth and sixth segments, in some individuals on seventh and rarely also on the following segments. This character varies greatly not only among the species but among individuals.

The presence of these spots was chosen by Jeannel (1940) as one of the main characters that established *Chrysostigma* in the "série" of *Callisthenes*, but it is not constant and hardly serves the purpose.

Pronotum usually notably wider than

long, with sides evenly arcuate, in some straighter posteriorly (*affine*), with one, rarely two, setae near the middle of lateral margin, but without setae at the base; hind angles broadly rounded; disk with rather rough sculpture (*semilaeve*), smoother (*affine*), or densely, finely punctate throughout (*cancellatum*).

Elytra often slightly wider towards apex, humeral angles mostly distinct, sculpture variable; foveae, if large, containing a little granule (*calidum*, *tepidum*, and *cancellatum*).

Ventral side finely, densely punctate, especially on the episternum (*calidum*, *tepidum*, *cancellatum*, *morrisoni*, and *obsoletum*), or coarsely, moderately densely punctured (*semilaeve*), or smooth, with sparser, larger punctures (*ampliator*). Metaepisternum longer than wide and wings well developed. Abdominal segments punctate on sides or completely so, in some species rough, wrinkled, and punctate (*semilaeve*) or with large punctures (*ampliator*) but mostly more finely punctate as in *affine*, *morrisoni*, and *obsoletum*; last abdominal segment bearing on the apex from eight to 12 or more setae, and usually, except in *cancellatum*, with no additional row of setae, closer to the middle of the segment; fourth and fifth segments having from two to four, seldom six, setae each: third segment either with two setae closer to the middle of the segment or additional and shorter setae closer to the sides (*cancellatum*, *obsoletum*, and some specimens of *affine*). Metatrochanter usually with one seta; middle tibiae straight or slightly arcuate, hind ones straight; anterior tarsi of male with three segments dilated and a dense brush underneath. Penis mostly narrowed towards the end and with a narrowly or more broadly rounded tip. Some species, such as *cancellatum*, have a long and slender tip; others, as *ampliator*, have the tip broadly rounded and the penis hardly narrowed towards the end. The genitalia of females are more or less of the same type in all species. Leaf-like process triangular, with a pointed or narrowly rounded tip, elongated furrow near it with two tiny setae, sometimes absent, base of the process coarsely (*calidum*, *affine*) or finely (*simplex*) punctate, and dorsal side strigose or rugulose and without a convexity in the middle. Some species, such as *calidum*, *morrisoni*,

cancellatum, and *affine*, have a stout gonapophyses, wide at the base; others, such as *tepidum*, *semilaeve*, *obsoletum*, and *simplex*, have it more slender and longer, with a pointed tip. Basal sclerites of genitalia moderately or strongly convex, as usual, punctate and with short hair on inner sides, sometimes with a few punctures on outer part also (figs. 185–190).

The subgenus *Chrysostigma* was first described by Kirby (1937) for two species, *calidum* and *frigidum*, because the last segment of the maxillary palpi is shorter and wider than the preceding. This is not true of *frigidum*, which has the last segment almost of the same length as the preceding; *frigidum* differs from *calidum* in other characters also and belongs in the subgenus *Calosoma* where it was placed by Jeannel (1940).

The subgenus *Carabosoma*, according to Jeannel (1940), is a synonym of *Chrysostigma*. *Carabosoma*, as described by Breuning (1928a), included not only *angulatum* and *peregrinator*, but also *affine*, *triste*, *tristoides*, *obsoletum*, *semilaeve*, and *simplex*. All these species are very different from the type of *Carabosoma* (*angulatum* Chevrolat) and are united by Jeannel (1940) in one subgenus (genus, according to him), *Chrysostigma*. It is true that they have more in common with *calidum* than with *angulatum*.

The subgenus *Tapinosthenes*, described by Kolbe (1895) for *cancellatum*, chiefly because of its even elytral margin, was also reduced by Jeannel (1940) to a synonym of *Chrysostigma*, and it really fits well in this subgenus. I follow Jeannel and leave in the subgenus *Chrysostigma* the following species: *calidum* Fabricius, *concreta* Casey, *cancellatum* Eschscholtz, *morrisoni* Horn, *affine* Chaudoir, *ampliator* Bates, *obsoletum* Say, *lepidum* LeConte, *tepidum* LeConte, *semilaeve* LeConte, and *simplex* LeConte.

KEY TO THE SPECIES OF THE SUBGENUS *Chrysostigma* KIRBY

1. Fourth, eighth, and twelfth interstices bearing foveae definitely wider and more elevated than other interstices; striae confused; margin near humeri even; black, with green luster, often with green, seldom bronze elytra. Length, 16–23 mm. Western part of the United States, Canada

- *cancellatum* Eschscholtz
Fourth, eighth, and twelfth interstices with
or without foveae, and not or only
slightly wider and not more elevated
than the adjacent ones; margin near
humeri usually serrated 2
- 2(1). Elytra with confused striae and deep, trans-
verse wrinkles or creases; pronotum nar-
rowed posteriorly; black or dark brown,
seldom coppery or bronze beetles; foveae
large, coppery or golden. Length, 16–24
mm. Western part of the United States
and Canada *tepidum* LeConte
Elytra with regular striae, sometimes ob-
literated towards apex; pronotum not
narrowed or less narrowed posteriorly
than in *tepidum* 3
- 3(2). Elytra with deep striae and convex inter-
stices, foveae large, as wide as or even
wider than interstices, coppery, golden,
or metallic green; dark bronze, brown-
ish black, or brown beetles 4
Elytral striae fine, often obliterated to-
wards apex; foveae smaller than elytral
interstices or absent; interstices flat or
only slightly convex; black or brownish
black beetles 6
- 4(3). Head and pronotum black, elytra reddish
brown, slightly convex. Length, 17–19
mm. New Mexico, Montana, and Can-
ada *lepidum* LeConte
Black, bronze, or dark brown beetles, with
rather convex elytra. Length, 19–25 mm.
. 5
- 5(4). Dark bronze or black beetles, stouter, with
sides of elytra slightly wider towards
apex. United States and Canada . . .
. *calidum* Fabricius
Greenish black, more slender; elytra with
parallel sides. Lake Superior, Kansas,
Missouri *concreta* Casey
- 6(3). Elytra hardly convex, with scaly interstices
slightly convex towards the base; foveae
usually small, greenish blue or violet.
Length, 17–24 mm. Western part of
United States *obsoletum* Say
Elytra more convex, with flat interstices,
smooth or scaly at basal part only, in
some species slightly convex at the very
base; foveae metallic green, golden, or
absent 7
- 7(6). Head and pronotum rough, densely punct-
ate and rugulose; sides of pronotum
evenly arcuate, not straighter poste-
riorly; elytra dull, because of the pres-
ence of fine wrinkles and punctures (fig.
25). Length, 17–30 mm. Southwestern
United States *semilaeve* LeConte
- Head and pronotum finely punctate and
wrinkled, if pronotum has a rougher sculp-
ture then it is narrowed posteriorly, with
sides straighter towards base; elytra
more or less shining, with much finer
sculpture. 8
- 8(7). Abdominal segments, including the last
segment, with large, coarse punctures on
the sides or on the entire segment; elytra
with deeply punctate striae, foveae usu-
ally absent; penis with broadly rounded
tip (figs. 118, 119). Length, 21–27 mm.
Mexico *ampliator* Bates
Abdominal segments finely punctured and
wrinkled, first and second more coarsely
so; elytral striae fine, even if distinctly
punctured, often obliterated towards
apex; foveae mostly present; penis with a
narrower tip (figs. 120, 122, 126) . . . 9
- 9(8). Elytra in both sexes definitely wider to-
wards apex, foveae often present, usually
coppery or golden. Length, 18–23 mm.
Colorado, Kansas, Mexico
. *morrisoni* Horn
Elytra with almost parallel sides, in some
females slightly wider towards apex;
elytral foveae, if present, usually green
or bluish. Length, 17–25 mm. . . . 10
- 10(9). Metaepisternum with sparser punctation;
elytral margin and base of pronotum usu-
ally with green luster; tooth of mentum
often short and blunt; inner armature of
the penis with a short hook (fig. 121).
Southwestern United States and Mexico
. *affine* Chaudoir
Metaepisternum densely and more finely
punctate; green luster usually absent,
tooth of mentum long and pointed; inner
armature of the penis with a long hook
(fig. 127). California. *simplex* LeConte
- Calosoma (Chrysostigma) cancellatum**
Eschscholtz
Figures 24, 80, 110, 185
Calosoma cancellatum ESCHSCHOLTZ, 1833, p. 23.
Type: San Francisco, California.
Calosoma aenescens LECONTE, 1854, p. 16. Type:
Fort Vancouver.
Calosoma esuriens CASEY, 1913, p. 64. Type:
San Diego, California.
Calosoma transversa CASEY, 1913, p. 64. Type:
San Diego, California.
Calosoma sagax CASEY, 1920, p. 158. Type: Las-
sen County, California.
Calosoma rectilatera CASEY, 1920, p. 158. Type:
Palm Spring, California.
Calosoma praestans CASEY, 1920, p. 159. Type:
Butte County, California.

DESCRIPTION: Black, dark brown, often with green luster, or with brilliant green elytra and pronotum. The entire head is densely punctate, slightly wrinkled at the front, with confluent punctures near eyes, and with one seta, seldom with two setae, near each eye; labrum curved, wrinkled; mandibles stout, usually strongly arcuate at the end, smooth or strigose and punctate; last segment of maxillary palpi shorter and a little wider than the preceding; antennae short, not or hardly reaching the humeri; second, third, and the base of fourth segments rather compressed, pubescent, beginning with the fifth segment, but with elongated, glabrous spots on fifth and sixth and often on the following segments. Pronotum twice as wide as long, slightly narrowed posteriorly, sides evenly arcuate, lateral margin much wider and flattened at the base, usually with one seta, in some specimens with two or three setae, near the middle of the margin; hind angles broadly rounded, extending beyond basal line, basal dimples large, disk densely, finely punctate, rugose at the base.

Elytra convex, slightly wider towards apex; humeral angles rounded, margin near them even; striae confused, interstices convex, with deep, transverse wrinkles or creases; foveae moderately large, often of semicircular form; interstices between foveae not wrinkled, but shining and chain-like. Ventral side dark brown, often with a metallic green luster; proepisternum, mesoepisternum, and metaepisternum finely punctate and wrinkled; sides of abdomen with a few punctures; last abdominal segment finely punctate, more so in female, bearing up to 10 or even 14 setae on apex and often two additional ones in the second row, closer to the middle; fourth and fifth segments with from two to six setae each and the third one with numerous, shorter setae. Legs short and stout, middle tibiae straight or hardly arcuate, hind ones straight. Penis with a long, slender tip (fig. 110); gonapophyses stout, distinctly punctate at base, tip an obtuse angle, furrow near it deep and setae inconspicuous; basal part of genitalia densely punctate on inner sides of sclerites (fig. 185).

Length, 16–23 mm.; width, 7–9 mm.

DISTRIBUTION: Western part of North America from British Columbia to California.

Canada: Southeast British Columbia. United States: Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, and Washington.

Calosoma esuriens Casey, from San Diego, California, is very much like *cancellatum*, but a little smaller. I think it is a definite synonym. Casey's *rectilatera*, *transversa*, and *sagax* are also synonyms. I fail to find any difference between them and *cancellatum*. *Calosoma praestans* Casey, from Butte County, California, although like *cancellatum*, is larger, has coppery elytra and slightly bronze head and pronotum. Of all Casey's species and subspecies of this group, this is the only one that is different; it is probably a variation of the typical form. Breuning (1928a) and Jeannel (1940) also considered all these forms to be synonyms.

Calosoma (Chrysostigma) cancellatum differs from all other species in the subgenus in the even elytral margin and elevated interstices between the foveae. I have seen large series of examples and among them only one specimen with serrated elytral margin. It is most like *tepidum*, and both species have confused elytral striae, but *tepidum* has no elevations between the foveae, and has the pronotum more narrowed posteriorly.

Previously *cancellatum* was placed by Kolbe (1895) and Breuning (1927) as the type of the subgenus *Tapinosthenes*, because of the even elytral margin. Now this subgenus is considered to be a synonym of *Chrysostigma*.

MATERIAL EXAMINED: Two hundred and fifty specimens.

Calosoma (Chrysostigma) tepidum LeConte

Figures 20, 111, 186

Calosoma tepidum LECONTE, 1851, p. 199. Type: Oregon.

Calosoma irregulare WALKER, 1866, p. 312. Type: Vancouver Island.

Calosoma tepida indigena CASEY, 1913, p. 61. Type: Oregon.

Calosoma tepida caelator CASEY, 1913, p. 61. Type: Idaho.

Calosoma pallax CASEY, 1920, p. 160. Type: Oregon.

Calosoma semicuprea CASEY, 1920, p. 161. Type: Rocky Mountains.

Calosoma congitans CASEY, 1920, p. 161. Type: Stockton, Utah.

DESCRIPTION: Black or dark brown, with

large coppery or golden foveae and rough elytral sculpture.

Head densely punctate and wrinkled, often with confluent punctures at the front and near eyes; labrum curved or with a little notch in the middle; mandibles usually slender, arcuate at apex, deeply strigose; antennae short, hardly reaching the humeri, second, third, and base of the fourth segments rather compressed and with sharp edge, fifth, sixth, and following segments with glabrous spots dividing pubescent area.

Pronotum twice as wide as long, or nearly so, narrowed behind; sides arcuate at the front, straighter posteriorly; lateral margin narrow, slightly wider at base; hind angles rounded, extending a little beyond the straight basal line; dimples near them not deep, but clearly visible; disk densely punctate throughout, wrinkled or rugose at base and sides.

Elytra round oval, slightly wider towards apex; striae confused, interstices with deep, transverse wrinkles, which are deeper than the striae, forming irregular tegulae, pointed and small on the sides; foveae round, large, coppery or golden, in worn specimens dark, containing a little granule, some individuals with additional short rows of foveae near margin, the latter slightly serrated or even near humeri.

Ventral side dark brown; prosternum, mesosternum, and metasternum, first abdominal segment, and sides of the following segments punctate and often wrinkled, last segment more coarsely punctate and wrinkled and bearing up to 10 or 12 setae on apex and no additional ones in the second row; fourth and fifth segments with two, in some four, setae each; third segment with two long setae in the middle and a few shorter ones closer to sides; not so numerous as in *cancellatum* nor as on the second segment which is always covered with numerous short setae. Penis as in *obsoletum*, slightly arcuate and rounded on the tip (fig. 111); gonapophyses longer and more slender than in *cancellatum* or *calidum*, with finer punctations, tip pointed, furrow near it long and bearing two tiny setae (fig. 186).

Length, 16–24 mm.; width, 7–10 mm.

DISTRIBUTION: Western part of North America from British Columbia to Arizona and California. Canada: British Columbia;

Vancouver Island. United States: Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, Oregon, Utah, Washington, and Wyoming.

Calosoma irregulare Walker, as was proved by Horn (1870), is a synonym of *tepidum*. The black specimens mentioned by Horn from Sacramento, California, are to be found together with the brown and are color variations. *Calosoma pallax* Casey is only a small *tepidum*. I saw the type and failed to find any difference other than size between it and *tepidum*.

Calosoma tepida indigens Casey is also a synonym; the form I have seen is smaller than most specimens of *tepidum*, but larger than *pallax*.

Calosoma tepida caelator Casey is a synonym also.

Calosoma congitan Casey, from Stockton, Utah, is larger, with slightly purplish elytra and greenish foveae; otherwise it is very much like *tepidum* and probably is a color variation.

Calosoma semicuprea Casey is a rather remarkable variation because of the bronze color of the elytra; otherwise it is like *tepidum*. Breuning (1927), and after him Jeannel (1940), reduced all Casey's species and subspecies to synonyms.

Calosoma tepidum is easily distinguished by the rough sculpture of its elytra, with confused striae and large foveae and no chain-like elevations between the foveae. Also the pronotum is narrowed posteriorly and the elytra are wider towards the apex; *cancellatum* also has confused elytral striae and large foveae, but it has distinct, chain-like elevations, the pronotum is more evenly arcuate, and the elytral sides are more parallel.

Calosoma tepidum is not a rare species and is abundant in the western part of the United States.

MATERIAL EXAMINED: Two hundred and twenty-five specimens.

***Calosoma (Chrysostigma) lepidum* LeConte**

Figures 21, 81, 112, 113

Calosoma lepidum LeConte, 1844, p. 201. Type: Missouri.

Calosoma microsticta Casey, 1897, p. 345 (in part). Type: Jemez Springs, New Mexico.

DESCRIPTION: Head and pronotum black,

elytra reddish brown. Head densely, finely punctate and deeply wrinkled at the front and near eyes, as in *obsoletum*; labrum with a little notch in the middle; mandibles arcuate at the end, deeply strigose and with a few punctures; antennae reaching the humeri, second, third, and base of the fourth segments compressed, fifth, sixth, and often the following segments with glabrous spots, dividing the pubescent area; tooth of the mentum long and pointed, as in *calidum*.

Pronotum twice as wide as long, slightly narrowed at the base, sides arcuate at the front part and straighter posteriorly; lateral margin wider and more lifted at the base; hind angles broadly rounded, extending a little beyond the basal line, dimples near them much smaller than in *calidum*; disk punctate and wrinkled.

Elytra more convex than in *obsoletum*, but less so than in *calidum*, in females often notably wider towards apex; reddish brown, with serrated margin near the humeri; striae regular and deep, punctate, punctures connected by lines; interstices convex, with fine, transverse wrinkles, deeper at the base, where they appear scaly, but not completely scaly as in *obsoletum*; foveae large, round, coppery or golden, often containing a small granule.

Ventral side brown, mesoepisternum and metaepisternum, as well as sides of abdomen, wrinkled and more or less finely punctate; metaepisternum only slightly longer than wide (fig. 81). Penis as in *obsoletum*, but inner armature more slender (figs. 112, 113). Gonapophyses as in *tepidum*, long and slender, with a pointed tip.

Length, 17–23 mm.; width, 7–11 mm.

DISTRIBUTION: Northwestern part of North America. Canada: Alberta: Medicine Hat, Calgary, Brooks, Tilley; Manitoba: Aweme. United States: Montana at Bearpaw, Harve, Helena, and Dutton near Great Falls. Dr. Lindroth (personal communication) collected it in Alberta, Manitoba, and Saskatchewan.

It is very doubtful that the locality of Jemez Springs, New Mexico, given by Casey for *microsticta* is correct. Actually of his two types of *microsticta*, one is *lepidum* LeConte and the other *obsoletum* Say.

Breuning (1927) and Jeannel (1940) placed

lepidum as a synonym of *calidum*, but *lepidum* is a different species. It is smaller than *calidum*, of a different color, with less scaly elytra and more slender and longer gonapophyses. The female genitalia of *lepidum* are as in *tepidum*; the male genitalia, as in *obsoletum*. Some examples of *lepidum* with wider pronotum are more like *obsoletum*, and some with the pronotum narrowed posteriorly and more scaly elytra are more like *tepidum*. However, *obsoletum* has less convex elytra, scaly from apex to base; *tepidum* has confused elytral striae and very wrinkled interstices. In large series of examples of *tepidum*, it is possible to find specimens with less confused elytral striae and almost the same color of the body as in *lepidum*, even though usually these species are very different.

MATERIAL EXAMINED: Sixty specimens.

***Calosoma (Chrysostigma) calidum* Fabricius**

Figures 22, 79, 114, 187

Carabus calidum FABRICIUS, 1775, p. 237. Type: "America."

Calosoma calidum expansa CASEY, 1897, p. 344. Type: Keokuk, Iowa.

Calosoma calidum laticollis CASEY, 1897, p. 344. Type: Las Vegas, New Mexico.

Calosoma calidum stellata CASEY, 1897, p. 344. Type: Lake Superior.

Calosoma comes CASEY, 1920, p. 156. Type: "Northwest Territory."

DESCRIPTION: Dark bronze, dark brown, or black, with large coppery or golden elytral foveae and convex body.

Head densely finely punctate and wrinkled, especially at the front and near eyes; labrum with a deep notch in the middle; mandibles moderately stout, in some specimens even rather slender, arcuate at the end, deeply strigose and punctate in creases; second, third, and base of the fourth antennal segments strongly compressed and with a sharp edge, fifth and sixth segments often having glabrous spots of different sizes, dividing the pubescent area, some individuals with narrower spots on the other segments also. Pronotum twice, or more than twice, as wide as long, sides evenly arcuate and flattened at the base, lateral margin much wider posteriorly; hind angles broadly rounded, slightly or moderately extending beyond the

basal line; dimples near them large; disk wrinkled, often rugose and punctate, mostly on base and sides.

Elytra slightly wider towards apex; striae deep, distinct, punctate; interstices convex, with transverse wrinkles connecting punctures of adjacent striae, towards sides at the basal part scaly; foveae large, round, containing a small granule, golden, coppery, or green; an additional row of foveae found near the margin, the latter serrated.

Ventral side dark brown; proepisternum, mesoepisternum, and metaepisternum, as well as sides or even a large part of abdominal segments, punctate and wrinkled; apex of last abdominal segment rugose in female, smoother in male and bearing eight to 12 setae, but no additional setae in the second row, closer to the middle of the segment; third, fourth and fifth segments having two setae each, the second one with numerous setae. Middle tibiae in both sexes slightly arcuate, hind ones straight. Penis slightly arcuate, narrowed towards the end, and with a rounded tip (fig. 114); gonapophyses stout, but longer than in *cancellatum*, tip narrowly rounded or pointed, furrow near the tip deep, with two tiny setae, base with large punctures, same as the inner sides of basal sclerites (fig. 187).

Length, 19–25 mm.; width, 8–12 mm.

DISTRIBUTION: The species is common in southern Canada and in the northern part of the United States, occurs infrequently in some of the southern states, and does not cross the Mexican border. Canada: Alberta, southern British Columbia, Nova Scotia, Ontario, and Quebec. According to Lindroth (1955) also in Newfoundland. United States: Colorado, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Dakota, Tennessee, Vermont, Virginia, Wisconsin, and eastern Washington.

Casey's *calidum expansa* from Keokuk, Iowa, is a synonym, as well as Casey's *calidum laticollis* (one example from Las Vegas, New Mexico). The only difference between *laticollis* and typical *calidum* is in the color of the foveae, which is slightly reddish

in *laticollis*. *Calosoma comes* Casey (one specimen from "Northwest Territory") is a little smaller than *calidum*, with sides of the elytra more parallel, but otherwise it is very much like *calidum* and apparently is a synonym.

Breuning in 1927 and Jeannel in 1940 also considered the above-mentioned species to be synonyms of *calidum*.

Calosoma calidum stellata Casey, from Lake Superior, is, according to Breuning (1928a), a race; Jeannel (1940) put it as a variation of *calidum*. It differs from the latter by having large and brilliant foveae, which spread onto the adjacent interstices and are closer to one another than in *calidum*. It is a northern form and was collected in the provinces of Ontario, Quebec, Alberta, and Nova Scotia. However, among the specimens from these regions it is always possible to find typical forms of *calidum* and also examples with the foveae not so large as in *stellata*, though larger than in typical *calidum*. Actually *stellata* is not so common as *calidum*, even in southern Canada; among numerous specimens of *calidum* that I have examined I have seen scarcely more than 20 to 25 examples of *stellata*.

MATERIAL EXAMINED: Two hundred and sixty-four specimens.

***Calosoma (Chrysostigma) concreta* Casey**

Figure 115

Calosoma concreta CASEY, 1920, p. 157. Type: Lake Superior.

This species, which occurs at Lake Superior along with Casey's "*stellata*," is placed by Breuning (1928a) as a variation of *stellata* and by Jeannel (1940) as a synonym of *calidum*. It differs in the slender and very convex body, with more parallel sides of the elytra, not wider towards the apex as in *calidum*; in its deep black color, with greenish, not bronze, luster; in the deeper foveae, which are not so large as in *stellata* and in some examples are even smaller than in most *calidum*; and in more slender and longer penis.

Length, 18–25 mm.; width, 8–10 mm.

DISTRIBUTION: Kansas: Topeka, Riley County. Missouri: Saint Joseph. Lake Superior.

I have seen the type in Casey's collections and four other specimens, all males, from the above-mentioned localities. In spite of the

likeness to *calidum*, I am inclined to believe that *concreta* is a separate species, as it was considered by Casey. However, I have not seen many examples (five specimens), and I have not seen the females. Further research is necessary.

***Calosoma (Chrysostigma) obsoletum* Say**

Figures 23, 116, 117

Calosoma obsoletum SAY, 1823, p. 149. Type: Arkansas River, Colorado.

Calosoma luxatum DEJEAN (not Say), 1826, p. 196. Type: "North America."

Calosoma microsticta CASEY, 1897, p. 345 (in part). Type: Jemez Springs, New Mexico.

DESCRIPTION: Dark brown or black species. Head finely, densely punctate and wrinkled; labrum curved or with a notch in the middle; mandibles usually strongly arcuate at the end and not stout, deeply strigose or even rugose; antennae short, hardly reaching the humeri, second, especially third, and base of the fourth segments rather compressed, fifth and sixth segments having large, glabrous spots, dividing the pubescent area, the following segments having narrower spots, disappearing towards the end.

Pronotum very wide, twice as wide as, or wider than, long in its widest part in the middle; sides evenly arcuate, lateral margin much wider and flattened at the base; hind angles broadly rounded, extending very little beyond the basal line, dimples near them moderate or large; disk completely punctate and wrinkled, at the base often rugose.

Elytra wide, with distinct humeral angles and serrated margin near them; striae distinct, punctured, interstices slightly convex or flat and scaly from base to apex, the transverse lines connecting punctures of adjacent striae deeper at the basal part, nearer the sides; foveae usually present, very small, blue or violet. However, I have seen one example with large, metallic green foveae, almost as in *calidum*.

Ventral side brown or brownish black; proepisternum, mesoepisternum, and metaepisternum, as well as first abdominal segment and sides of the following ones, finely punctate and wrinkled, often the whole abdomen finely punctate and wrinkled, last segment more strongly so, bearing from eight to 24 setae, usually all in one row, on the apex and

sides (four to 12 on each side); fourth and fifth segments having two to four setae each and the third segment, in addition to two longer setae in the middle, having in some specimens shorter setae, often rather numerous and closer to the sides of the segment. Penis narrowed towards the end, tip rounded (figs. 116, 117); gonapophyses as in *semilaeve*, slender, not so long as in *tepidum*, tip pointed, furrow near it with two tiny setae, not always conspicuous; basal part of genitalia with sparse punctures on the inner sides of sclerites.

Length, 17–24 mm.; width, 7–11 mm.

DISTRIBUTION: Western part of the United States from Washington to New Mexico. Colorado, North Dakota, South Dakota, Idaho, Kansas, Montana, Nebraska, New Mexico, eastern Oregon. According to Burgess and Collins (1917), also Texas and Northwest Territories in Canada. Dr. Lindroth (personal communication) collected it in Alberta, Manitoba, and Saskatchewan.

Dejean's species *luxatum* was proved by Breuning (1928a) to be a synonym of *obsoletum*. It has nothing in common with *Microcallisthenes luxatus* Say.

Of the specimens labeled "*Calosoma obsoletum* ssp. *microsticta* Casey" in Casey's collection, one example is *lepidum*, the other *obsoletum*.

Calosoma obsoletum is easily distinguished from the other species of the subgenus by the slightly convex elytra, with distinct humeri, and the interstices which are scaly from the base to the apex, with small, bluish foveae.

MATERIAL EXAMINED: One hundred and fifty specimens.

***Calosoma (Chrysostigma) ampliator* Bates**

Figures 83, 118, 119

Calosoma ampliator BATES, 1891, p. 223. Type: Villa Lerdo, Durango, Mexico.

DESCRIPTION: Black species. Head rather densely punctate throughout, with confluent punctures and deep wrinkles at the front and near eyes; labrum rather curved at margin; mandibles stout, rugose and punctate, or deeply strigose, with punctures in the creases; tooth of mentum short and pointed; antennae short but reaching the humeri, second, third, and base of the fourth segments notably

compressed, beginning with the fifth segment, uniformly pubescent. Pronotum twice as wide as long, or nearly so, with sides strongly arcuate, narrowed posteriorly; lateral margin a little wider towards base; hind angles small and hardly extending beyond basal line; disk finely and densely punctate and wrinkled, punctures much finer than on the head, base and sides at the basal part rougher.

Elytra with almost parallel sides, distinct humeral angles and serrated margin near them; striae punctured from base to apex, interstices flat or slightly convex, with transverse lines connecting punctures of adjacent striae, scaly at their basal part towards sides; foveae inconspicuous.

Ventral side dark brown or black; prosternum rather wrinkled, proepisternum smooth or with a few fine punctures; mesoepisternum, metaepisternum, and abdominal segments with large, deep punctures, often third, fourth, and fifth abdominal segments punctate only on sides, but first, second, and last segments in all specimens punctate throughout; usually eight setae on the apex of the last abdominal segment, and mostly two, rarely four, setae on the third, fourth, and fifth segments. Anterior tarsi with three broadly dilated segments, the second one twice as wide as long, all three with a dense brush underneath. Penis hardly narrowed towards end, with a broadly rounded tip (figs. 118, 119); gonapophyses as in *calidum*.

Length, 21–27 mm.; width, 8.5–11 mm.

DISTRIBUTION: Mexico: Chihuahua; Durango: Villa Lerdo; Guanajuato; Sonora: Valle de Yaqui; Tamaulipas: Nuevo Laredo; Veracruz: Jalapa. Panama: Chiriqui.

Breuning (1927) and Jeannel (1940) place *ampliator* as a synonym of *affine*. However, Breuning thinks that *affine* (synonym *ampliator*) is a southern species which occurs only in Mexico. His description of *affine* corresponds to the description of Bates's *ampliator*. Jeannel, who saw the type of *affine*, places it as a synonym of *triste*, *tristoides*, and *ampliator*, and his short description of *affine* is closer to the description of LeConte's *triste*.

I have not seen the type of *affine*, but Patricia Vaurie examined it for me and compared it with the examples of *triste* and *ampliator* in the American Museum. Both types (fe-

male) and cotype (male) have fine punctuation on the head and on the abdominal segments, especially on the last segment, as in *triste*, not the large, deep punctures as in *ampliator*. Apparently, Jeannel (1940) was correct in considering *triste* and *tristoides* as synonyms of *affine*. But *ampliator* is a different species. I have not seen the type of *ampliator*, but the examples that I have seen fit very well Bates's description of *ampliator* and also Breuning's description of *affine*. The difference between *ampliator* and *affine* is obvious; *ampliator* is coarsely punctate on the ventral side, the elytral striae are not obliterated, the interstices in some specimens are convex, the pronotum is almost angular on the sides, as in *peregrinator*, and the penis is broadly rounded and scarcely narrowed towards the end (fig. 118). On the contrary, *affine* is finely punctate on the ventral side, has finer elytral striae, often obliterated towards the apex, the interstices are flat, the sides of the pronotum are less arcuate, and the penis is narrowed towards the end, with the tip less rounded (fig. 120).

MATERIAL EXAMINED: Six specimens.

Born's *azoricum* is placed by Blackwelder (1944) as a synonym of *ampliator*. Apparently this is an error, because, according to Born (1918), *azoricum* inhabits only Madeira Island.

Calosoma (Chrysostigma) affine Chaudoir

Figures 67, 82, 120, 121

Calosoma affine CHAUDOIR, 1843, p. 746. Type: "Mexico."

Calosoma triste LECONTE, 1844, p. 201. Type: Missouri.

Calosoma tristoides FALL, 1910, p. 92. Type: San Diego, California.

DESCRIPTION: Black, some specimens with a green luster; head finely, densely punctate at the front and near eyes; mandibles stout, rugose, and punctate; tooth of mentum often short and blunt (fig. 67); antennae short, but reaching the humeri, with elongated, glabrous spots on fifth segment in some specimens, in others on the following segments also.

Pronotum twice as wide as long, or nearly so, narrowed posteriorly, sides arcuate, lateral margin slightly wider and lifted at the base; hind angles rounded, extending slightly

beyond the basal line, dimples near them conspicuous; disk finely wrinkled, rugose and punctate towards base, often with green luster near hind angles.

Elytra deep black or brownish black, with distinct humeri and serrated margin near them; sides almost parallel; striae finely punctate, in smoother examples obliterated towards apex; interstices flat, with fine, transverse wrinkles, deeper at the basal part, towards sides, where elytra are scaly; foveae small, metallic green, usually present.

Ventral side smooth, propisternum in some specimens with a few punctures, mesoepisternum mostly sparsely punctate, and metaepisternum with sparse, large punctures or with denser punctations. Abdominal segments finely punctate and wrinkled on the sides, first and last ones entirely so; last segment bearing from eight to 12, occasionally 18, setae on the apex, usually all in one row; fourth and fifth segments having two to four setae each, and third segment with two longer setae, closer to the middle of the segment and often a few shorter setae, closer to the sides. Penis stout, narrowed towards end, with a rounded tip, inner armature with a short hook (figs. 120, 121); gonopophyses as in *calidum*, stout, more or less coarsely punctate, tip rounded or pointed, furrow near it with two tiny setae, often inconspicuous.

Length, 20–28 mm.; width, 8–11 mm.

DISTRIBUTION: Southwestern part of the United States, and occasionally in Mexico. United States: Arizona: Apache County: Navajo; Cochise County: Benson, Chiricahua Mountains, Douglas, Huachuca; Maricopa County: Hassayampa district, Phoenix; Gila County; Globe, Pima County: Tucson; Pinal County: Picacho; Santa Cruz County: Nogales, southwest of Patagonia, Washington Mountains; Yavapai County: Dewey, Granite Mountains, Prescott, Seligman. California: Imperial County: El Centro; Orange County: Santa Ana, Stanton; San Diego County: Poway, San Diego; San Joaquin County: Lindsay, Manteca. Colorado: Baca County: Regnier; Denver County: Robinson; Larimer County: Fort Collins. Kansas: Atchison County; Clark County: Ashland; Hamilton County: Coolidge; Kiowa County: Belvidere; Reno County; Fort Riley County; Rooks County: Stockton; Sherman County:

Goodland. Missouri. Nebraska. New Mexico: Dona Ana County: Las Cruces; Jemez. Oklahoma: Cleveland County: Norman. Texas: Brewster County: Alpine; Brown County: Brownwood; Davis Mountains; Starr County: Rio Grande. According to Burgess and Collins (1917), also in Arkansas. Mexico: Chihuahua: Santa Barbara, Salas; Durango: Villa Lerdo; Federal District: Guadalupe; Hidalgo: Pachuca; Nuevo Leon: Apodaca, Monterrey; Oaxaca: Zaachila. Tamaulipas: Valle del Maiz.

There are distinct variations in the specimens of *affine* collected in different localities. Examples from San Diego, California, mostly (72% of the specimens examined) have finely wrinkled, dull elytra, not scaly at the base, and have fine striae, with minute punctures connected by thin lines. These forms were described by Fall (1910) under the name of *tristoides*. Specimens from El Centro and other localities in California often have more distinct punctures of the striae. In Arizona most of the beetles (72%) have smoother, shining elytra, but with deep wrinkles at the base towards the sides (scaly elytra); the elytral striae have distinct punctures, which are not always connected by lines. Examples from Texas have wrinkled elytra, as in the beetles from California, but the striae are mostly distinctly punctured. In the other states (Colorado, Kansas, Oklahoma) *affine* is like specimens from Arizona, but 25 per cent of the beetles examined are intermediate, some approaching the Arizona forms, some the California forms. Among the seven specimens that I have seen from Mexico four were more like the Arizona specimens and three were like the California ones. The tooth of the mentum is also not similar in the specimens collected in different places. In California 50 per cent of examples have it short and blunt, and 50 per cent have it pointed and longer. In Arizona 60 per cent of the specimens have a blunt tooth of the mentum, but farther to the east (Kansas, Oklahoma) most of the examples have a pointed tooth of the mentum and only 27 per cent have it short and blunt.

Fall's *tristoides* from San Diego, California, is not a distinct species but a variation of *affine* and a synonym. The difference between the two forms is in the finer punctation of the

elytral striae in *tristoides* (examples collected mostly in San Diego); specimens from other places in California have a more distinct punctuation. The two types, which I have compared, of *triste* LeConte and *tristoides* Fall are very much alike in every respect, including the genitalia (both have the same short hook of the inner armature of the penis), but the elytral striae are finer in *tristoides*. However, even this character is less striking than in some extreme forms from Arizona and California. The green luster, which, according to Fall (1910), is present in *tristoides* and absent in *triste*, is always present in fresh beetles and absent in worn examples.

Breuning (1928a) places *tristoides* as a subspecies of *triste* and *affine* as a different species, which does not occur in the United States. Jeannel (1940) thinks that all three are synonyms. I agree with him, because the type of *affine* is like *triste*, with the same fine punctations on the abdominal segments and on the head, the same form of pronotum, and the same fine elytral striae, obliterated towards the apex. As for *ampliator*, which was placed by Jeannel (1940) as a synonym of *affine*, it is a different species, easily distinguished from *affine* by the large punctures on the abdominal segments and on the head. Actually, some specimens of *affine*, mostly the examples from California, with finely wrinkled elytra, very fine striae, and more densely punctate metaepisternum, are more like *simplex* than *ampliator*. They can be distinguished from *simplex* only by the green luster on the elytral margin and the foveae, usually absent in *simplex*, and by the inner armature of the penis which has a short hook in *affine* (fig. 121) and a long one in *simplex* (fig. 127).

MATERIAL EXAMINED: Two hundred and sixty-eight specimens.

***Calosoma (Chrysostigma) morrisoni* Horn**

Figures 25, 122, 123, 190

Calosoma morrisoni HORN, 1885, p. 128. Type: Colorado.

Calosoma mexicanum GÉHIN, 1885, p. 67, pl. 9, fig. 15. Type: "Mexico."

DESCRIPTION: Black, shining, with round-oval elytra. Head densely and finely punctate throughout, at the front wrinkled and more

strongly punctured, with confluent punctures near eyes; labrum curved or with a deep notch in the middle; mandibles slightly arcuate at end and rough; strigose and punctate, moderately stout; antennae reaching a little beyond the humeri, second, third, and the base of fourth segments compressed and with a sharp edge; fifth and sixth segments often having glabrous spots, dividing the pubescent area; tooth of mentum long and pointed, as in the majority of species in this subgenus. Pronotum twice as wide as long, the widest place near or a little before the middle; sides arcuate at the front part, straighter posteriorly; hind angles broadly rounded, slightly extending beyond basal line, which is straight; lateral margin a little wider and lifted posteriorly; dimples at base deep; disk finely, densely punctate and wrinkled, rugulose, and with coarser punctures at base, sides, and apex.

Elytra round-oval, distinctly wider towards apex; humeri slightly rounded, margin near them serrated; striae finely punctate, interstices flat, with fine, transverse wrinkles near humeri; foveae absent, or shallow and small, but clearly visible because of the coppery or golden luster, some examples having larger foveae.

Ventral side brown; proepisternum, mesoepisternum, and metaepisternum finely punctate and wrinkled, as well as the sides of the abdomen and the entire last abdominal segment, which bears eight setae on the apex; third, fourth, and fifth segments having two or four setae each. Metatrochanter with one setae; middle tibiae slightly arcuate in both sexes, hind ones straight. Penis as in *obsoletum*, *semilaeve*, and others of the group (figs. 122, 123); gonapophyses as in *calidum*.

Length, 18–23 mm.; width, 8–11 mm.

DISTRIBUTION: Southwestern United States and northern Mexico. Does not seem to be common in any state. Has been recorded from Colorado, southern California, Nevada, New Mexico, and from Durango in Mexico.

This species is distinguished from other similar species of the subgenus by the elytra, which are distinctly wider towards the apex, by the dense punctuation of the thorax, especially the metaepisternum, and by the long, pointed tooth of the mentum. *Affine*, which is

more like *morrisoni*, has larger, sparser punctures on the metaepisternum, sides of the elytra more parallel, and a shorter tooth of the mentum. As for *calidum*, *tepidum*, and other species of this subgenus, which also have a long tooth of the mentum and fine, dense punctation on the ventral side, they all are quite different, especially in the form and sculpture of the elytra, and cannot be confused with *morrisoni*.

Calosoma mexicanum Géhin which, according to Breuning (1928a), has large foveae, almost as in *calidum*, is only a variation of the typical form. I have seen examples from Durango with hardly visible foveae and some specimens from Colorado with large foveae, although not so large as in *calidum*.

Calosoma (Chrysostigma) morrisoni seems to be a not very common species, and was collected mostly in Colorado.

MATERIAL EXAMINED: Twenty specimens.

***Calosoma (Chrysostigma) semilaeve* LeConte**

Figures 26, 68, 124, 125, 188

Calosoma semilaeve LECONTE, 1851, p. 199.
Type: San Diego, California.

Calosoma semilaeve davidsoni CASEY, 1914, p. 33.
Type: Alameda County, California.

Calosoma semilaeve adjutor CASEY, 1920, p. 162.
Type: Alameda County, California.

DESCRIPTION: Black, dull beetles, some specimens with a faint bluish luster. Head densely punctate, rugose and with confluent punctures at the front, more finely punctate on clypeus and occiput; labrum with a little notch in the middle; mandibles deeply strigose and punctate in creases; antennae short, hardly reaching the humeri, second, third, and base of fourth segments rather compressed, fifth, sixth, and following segments often having glabrous spots, dividing pubescent area.

Pronotum almost twice as wide as long, sides evenly arcuate, in some specimens rather strongly arcuate; lateral margin wider and flattened at the base; hind angles rounded, notably extending beyond the sinuate basal line; dimples near them rather deep, disk very rough, densely punctate and heavily wrinkled, rugose at sides, base, and apex.

Elytra with distinct humeral angles and serrated margin near them; striae fine, punctate, interstices flat, with extremely fine wrinkles and punctation, which makes elytra dull, basal half with deep, transverse wrinkles (scaly); foveae hardly visible or absent.

Ventral side dark brown or black; proepisternum wrinkled, with sparse punctures, mesoepisternum and metaepisternum also wrinkled, but with denser punctation; abdomen very finely punctate and wrinkled throughout, first segment and sides of the second with coarser punctures; last one with eight to 10 setae on the apex; third, fourth, and fifth segments with two, seldom four, setae each. Penis narrowed towards the end, with a little round tip (figs. 124, 125); gonapophyses more slender than in *calidum*, as in *obsoletum* but larger, tip pointed, furrow near it long, with two tiny setae, punctation finer than in *calidum*, but coarser than in *simplex* (fig. 188).

Length, 17–30 mm.; width, 7–11 mm.

DISTRIBUTION: Western United States. Arizona, California, Guadalupe Island, Idaho, eastern Oregon, Utah.

Casey's subspecies *davidsoni*, which differs from the type of *semilaeve* by its narrower body, and Casey's *adjutor*, which has a finer punctation on the head, are synonyms, as shown by Breuning (1928a) and Jeannel (1940).

The species *semilaeve* is easily distinguished from the other beetles of the subgenus by the rough sculpture on the head and pronotum and the dull, scaly elytra. It is more similar to *simplex* but is larger and has a rougher sculpture and less stout head. It is also more common than *simplex*.

MATERIAL EXAMINED: Two hundred and sixty-seven specimens.

***Calosoma (Chrysostigma) simplex* LeConte**

Figures 27, 126, 127, 189

Calosoma simplex LECONTE, 1878a, p. 61.
Type: Middle California.

DESCRIPTION: Black, head stout, punctate throughout, clypeus with finer punctation, occiput smooth; mandibles smooth or strigose; antennae short but reaching the humeri, often with glabrous spots on fifth and following segments.

Pronotum one and a half times or twice as wide as long, narrowed posteriorly, sides arcuate at the front part and straighter be-

hind; lateral margin slightly wider and flattened at base; hind angles rounded, produced slightly or more conspicuously beyond the basal line; dimples near them deep; sculpture rough, but smoother than in *semilaeve*, as in *triste*, disk in some specimens finely punctate, in others wrinkled and more coarsely punctate, with confluent punctures and deep creases at base.

Elytra oblong-oval, sides parallel, hardly wider towards apex; striae finely punctate, interstices flat, finely wrinkled, at basal part scaly but smoother than in *semilaeve*; foveae often absent, if present then small and bluish, purplish, or green.

Ventral side as in *semilaeve*, but penis often a little more slender, and inner armature a little thinner (figs. 126, 127); gonapophyses with punctation finer than in *semilaeve*.

Length, 17–23 mm.; width, 7–10 mm.

DISTRIBUTION: It seems that *simplex* is localized in California: Los Angeles County; Madera County; Merced County: Pinoche Hill; Mojave Desert; Riverside County: Palm Springs; San Benito County: Panoche; San Bernardino County: Victorville; Yolo County: Davis. According to Burgess and Collins (1917), it also occurs in Arizona, Colorado, and Texas, but I have seen examples from California only.

In the literature *simplex* is usually compared to *semilaeve*. Actually it is more like *affine*, and sometimes it is even difficult to distinguish them. However, it differs from *affine* in denser punctation of the metaepisternum, in longer, or at least more pointed, tooth of the mentum, in the absence of green luster, but above all in the inner armature of the penis, which has a long hook at the end (fig. 127). Some specimens with rough elytral sculpture are more similar to *semilaeve*, but this is exceptional. The punctation of the metaepisternum and the inner armature of the penis are as in *semilaeve*.

There is a slight difference between the beetles collected in Merced County and those from Yolo County. Examples from Davis, Yolo County, have a stouter head, with longer, swollen occiput (65% of the beetles examined), and nearly all have rugose mandibles and bright green foveae; they seem to be like *affine*. The specimens from Merced County, Pinoche Hill, have smooth mandi-

bles, foveae bluish or purplish, often inconspicuous, but the head is as in *affine*; only 30 per cent of the beetles examined had a swollen occiput.

MATERIAL EXAMINED: Forty-four specimens.

SUBGENUS *CALLITROPA* MOTSCHULSKY

Callitropa MOTSCHULSKY, 1865, p. 300. Type: *Carabus externum* Say.

Paratropa LAPOUGE, 1929, p. 3. Type: *Calosoma macrum* LeConte.

DESCRIPTION: Black, body elongated; head with large, sparse punctures; eyes projecting, with one seta near each; tooth of the mentum long and pointed; last segment of maxillary palpi shorter and wider than the preceding; antennae normally long, second segment slightly compressed, third and base of fourth notably so, beginning with the fifth, uniformly pubescent.

Sides of pronotum slightly arcuate, flattened at the base; lateral margin wider and more lifted towards base, bearing one seta in the middle; hind angles broadly rounded, extending beyond the basal line; disk smooth or wrinkled.

Elytra oblong-oval, with more or less parallel sides; striae either deep and interstices convex and scaly (*externum*), or fine, obliterated towards the apex, and interstices flat (*macrum* and *protractum*); foveae inconspicuous, elytral margin near the humeri usually even, except in *externum*.

Ventral side smooth, usually with large, sparse punctures on mesoepisternum, metaepisternum, and first and second abdominal segments; last segment punctate and wrinkled, in the male bearing eight to 14 setae, seldom more, on the apex and with or without additional setae in the second row, closer to the middle of the segment; in the female the apex is covered with short, erect hair, among which the usual row of setae is lost. Third, fourth, and fifth segments, in most specimens, with two setae each; in some specimens, four; and in a few, six. Third segment in some specimens, and in others the fourth also, without setae. Setae shorter than in the subgenera *Chrysostigma*, *Camedula*, and others. Pore punctures very small, and, if a seta is lost, the pore puncture almost impossible to find. Metaepisternum longer than

wide and wings well developed. Legs normally long, middle and hind tibiae straight in both sexes; anterior tarsi of male with three or four segments dilated and bearing a dense brush underneath. Penis wide, the tip an obtuse angle, inner armature with a hook at the end. Gonapophyses stout, with a rounded tip, furrow near it elongated or triangular and bearing two small setae which do not reach the tip of the process, base punctate and with short hair; dorsal side impressed, without a convexity, rugulose or strigose and punctate. Basal sclerites of genitalia punctate on their inner sides, especially in *externum*, some punctures on outer sides also, all bearing short, erect hair (figs. 191-194).

The subgenus *Callitropa* was described by Motschulsky (1865) because of the even elytral margin, a character that seems not to be constant, because *externum* sometimes has slight serrations. The second character described by the author (smooth anterior tibiae) is also not constant. Only the third character (straight middle and hind tibiae) is indisputable. Nevertheless, the subgenus is quite distinct; it differs in the elongated body, the form of the pronotum, with broadly rounded, flattened hind angles, in the genitalia, in the hairy apex of the last abdominal segment in the female, and in other, minor, characters.

There are three species in the subgenus: *externum* Say, *macrum* LeConte, and *protractum* LeConte.

Jeannel (1940) considered *Callitropa* to be a genus in the "série phyl. de *Callitropa*," which also includes *Camedula*, *Carabomimus*, and *Calopachys*. He united them in one series because of the absence of basal setae on the pronotum, the presence of a seta on the meta-trochanter, and the absence of a brush on the straight middle tibiae. In the subgenus *Callitropa* (genus, according to Jeannel), he placed not only the three above-mentioned species, but also *palmeri* Horn and several species of the subgenus *Blaptosoma*. I leave in *Callitropa* only *externum*, *macrum*, and *protractum*. Following Breuning, I put the other species in the subgenus *Blaptosoma*, and *palmeri* in the subgenus *Paracalosoma*. The wingless species of *Calosoma* (subgenus *Blaptosoma*) differ greatly in many external

characters, such as short and wide meta-episternum, rounded humeri, usually smooth prothorax, absence of depressions near the eyes, and general outlines of the body.

KEY TO THE SPECIES OF THE SUBGENUS

Callitropa MOTSCHULSKY

1. Elytra with deep striae and convex, scaly interstices; elytral margin and sides of pronotum violet or purplish blue. Length, 24-35 mm. Eastern part of the United States *externum* Say
Elytra with fine or obliterated striae and flat interstices; elytral margin and sides of pronotum with a faint green or violet luster or without it 2
- 2(1). Elytral striae not punctured, almost obliterated, but at basal part with a few large punctures. Length, 24-32 mm. Western part of the United States and Mexico *macrum* LeConte
Elytra with punctate striae, obliterated towards sides, punctures at basal part larger, but not so large as in *macrum*. Length, 22-27 mm. Arizona and Mexico *protractum* LeConte

Calosoma (*Callitropa*) *externum* Say

Figures 77, 128, 191, 192

Carabus externum SAY, 1823, p. 149. Type: Arkansas.

Calosoma longipenne DEJEAN, 1831, p. 568. Type: North America.

DESCRIPTION: Black, with blue or violet sides of pronotum and elytral margin; body elongated. Head smooth or very finely wrinkled, often with a few large, shallow punctures at the front and wrinkles near eyes; labrum slightly curved, smooth; mandibles finely strigose or smooth.

Pronotum a little less than twice as wide as long, sides evenly arcuate and flattened at the base, with lateral margin broader at basal part and less distinctly divided from the disk than in apical part; hind angles broadly rounded and extending beyond the basal line; dimples near them large; disk smooth or finely wrinkled, rugose and punctate at base, especially near hind angles.

Elytra elongated, slightly wider towards apex; striae deep, punctate, punctures connected by lines; interstices convex, with transverse wrinkles, deeper at basal part towards sides (scaly elytra); elytral margin

either serrated or even; foveae inconspicuous.

Ventral side dark brown or black; propisternum smooth, dull, mesoepisternum slightly granulated, in some species also punctured, metaepisternum, as well as the first and second abdominal segments, with sparse, large punctures, the other segments punctate on sides only, but the last segment deeply wrinkled and in females with erect hair on the apex in which the usual row of setae is lost, the males with up to eight setae, in some specimens more, on the apex, often in confused rows. Metatrochanter with or without setae [according to Jeannel (1940) all beetles in the "série *Callitropa*," except the subgenus *Camegonia*, have a seta on the metatrochanter]. I have examined a number of specimens from different localities, and 50 per cent of them had no setae, although some had two or even three setae on the metatrochanter. Anterior tarsi of male with four segments dilated and with a dense brush underneath. Penis wide, narrowed towards the end, with broadly rounded tip (fig. 128); gonapophyses as in *cancellatum*, tip obtuse and basal part of genitalia densely punctate and with short hair on the inner sides of sclerites (figs. 191, 192).

Length, 24–35 mm.; width, 9–12 mm.

DISTRIBUTION: Eastern and southern United States, from Massachusetts to South Carolina; and southeastern Canada. Seems to be more common in the southeastern United States. Arkansas, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maryland, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, and Texas. Canada: Southern Ontario.

This species differs from the other two species of the subgenus in the scaly elytra, with deep striae and convex interstices. At first glance it seems to resemble *angulatum* Chevrolat (subgenus *Carabosoma*), but the latter is smaller, with strongly angulated sides of the pronotum and small, pointed hind angles.

Calosoma longipenne Dejean has long been considered a synonym of *externum*.

MATERIAL EXAMINED: One hundred specimens.

***Calosoma (Callitropa) macrum* LeConte**

Figures 28, 59, 129, 193

Calosoma macrum LeConte, 1853, p. 400. Type: Texas.

DESCRIPTION: Black species, body elongated. Head with large, sparse punctures and deep wrinkles at the front, near eyes, and, in some specimens, sides of clypeus; some specimens also have a light greenish luster in the punctures; labrum with a small notch in the middle; mandibles stout, rather strigose and often punctured; eyes projecting.

Pronotum less than twice as wide as long, the widest part behind the middle, sides evenly arcuate, flattened at the base; lateral margin much wider and more lifted at basal part, often with a faint violet luster; apical margin with a thin blue line; hind angles broadly rounded, extending moderately beyond the basal line; dimples near them large and deep; disk smooth or finely wrinkled, often with a few punctures at the base.

Elytra elongated, with very faint striae, or only traces of them, finely, transversely wrinkled and towards the base with a few large, deep punctures, scattered or in short rows along the striae; elytral margin even and often with a faint green luster.

Ventral side dark brown or black, shining, smooth, with a few large punctures on metaepisternum, first and second abdominal segments, and sides of the other segments; last abdominal segment in female wrinkled on sides, rugose and punctate or even granulated and with erect, short hair on the apex, in which the usual row of setae is lost; male having only a few wrinkles on the apex and, in most specimens, 12 or 14 setae. Metatrochanter usually with one seta; anterior tarsi of male having only three segments, with a dense brush underneath, the fourth segment either glabrous or with a few longer hairs. Genitalia in both sexes as in *externum* (figs. 129, 193), but gonapophyses a little shorter and less punctured.

Length, 24–32 mm.; width, 9–12 mm.

DISTRIBUTION: Southwestern United States, and Mexico. Louisiana and Texas. Mexico: Nuevo Leon: Monterrey; Tamaulipas: Nuevo Laredo. According to Jeannel (1940) also in Arkansas.

LeConte, in his synoptic table (1878b), put

macrum in the group with *externum* and *protractum*, because he thought that the males of all three species had four segments with a dense brush underneath; actually *macrum* and *protractum* have only three segments with a brush.

Calosoma (Callitropa) macrum is similar to *protractum*, but differs in being of larger size and in having larger punctures on the basal part of the elytra and almost obliterated striae. It is found mostly in the western states; *externum*, in the eastern states; and *protractum*, in the west and in Mexico.

MATERIAL EXAMINED: Sixty specimens.

***Calosoma (Callitropa) protractum* LeConte**

Figures 130, 194

Calosoma protractum LECONTE, 1862, p. 52. Type: Arizona.

Calosoma dollens CHAUDOIR, 1869a, p. 376. Type: Oaxaca.

Calosoma truncatum HAURY, 1885, p. 64. Type: "Mexico."

DESCRIPTION: Black species, similar to *macrum* but smaller, Head with large, sparse punctures and wrinkles at the front, near eyes and sides of clypeus; eyes projecting; labrum slightly curved; mandibles stout, deeply strigose and punctate.

Pronotum about one and one-half times as wide as long, the widest place in the middle, or behind it; sides evenly arcuate, flattened posteriorly; lateral margin much wider at the base; hind angles extending moderately or slightly beyond the basal line, broadly rounded, with distinct dimples near them; disk smooth or wrinkled, at base rugose and punctate, at apex and sides often with a few punctures.

Elytra elongated; striae finely punctured, distinct, towards sides and apex obliterated (in other *Calosoma* striae always deeper towards the sides); interstices flat, very finely wrinkled, on the basal part with a few large punctures, which are smaller than in *macrum*; elytral margin even, in some with a faint blue or violet luster.

Ventral side dark brown or black, smooth, mesoepisternum with a few large punctures; metaepisternum, first abdominal segment, and sides of the other segments with sparse punctures; in female last segment wrinkled

and punctate on the sides and apex, and with short, erect, reddish hair on the extreme apex of the segment; male with from eight to 12 setae on the apex of the last segment. Anterior tarsi of male with three segments dilated and bearing a dense brush of hair underneath.

Penis as in *macrum*, but wider (fig. 130); gonapophyses also as in *macrum*, smoother than in *externum*, with a more rounded tip (fig. 194).

Length, 22–27 mm.; width, 7.5–9.5 mm.

DISTRIBUTION: Southwestern United States and Mexico. Arizona and Colorado. According to Burgess and Collins (1917), also from Kansas, but this seems doubtful. Mexico: Durango: Nombre de Dios, Sierra Nayarit; Guanajuato; Guerrero: Amula, Capulpan; Jalisco: Guadalajara; Nuevo Leon: Monterrey, Villa de Gareis; Morelos: Cuernavaca, Jalastoc, Puente de Ixtla, Progreso; Puebla; Oaxaca.

Apparently this species lives in the mountains. Snow collected it at an altitude of 3750 feet (Burgess and Collins, 1917); Cazier, at 4400 feet.

Calosoma dollens Chaudoir and *truncatum* Haury, as shown by Breuning (1928a), are synonyms of *protractum*.

According to Jeannel (1940) *protractum* differs from *macrum* in having a smoother pronotum, with a distinct marginal bead on the sides. I have examined 20 specimens of *protractum*, and almost all have the pronotum punctate at the base, rugose near the hind angles, with a side marginal bead distinct only at the front; I have seen 60 examples of *macrum*, which has often a smoother pronotum, less punctate at the base or in the basal dimples, and many specimens have a rather distinct marginal bead. The differences between the two seem to me to be: smaller size and more slender body of *protractum*, more distinct elytral striae with finer punctures on the basal part, wider penis, and less hairy apex of the last abdominal segment in the female; *protractum* has only a few setae in the pore punctures of the last abdominal segment; all examples of *macrum*, even small ones, are stouter, with the elytral striae obliterated or very fine, but the punctures at the basal part large and deep, a narrower penis in the males, and short erect, and

thicker hair on the apex of the last abdominal segment in the females.

MATERIAL EXAMINED: Twenty specimens.

SUBGENUS **PARACALOSOMA** BREUNING

Paracalosoma BREUNING, 1927, p. 141. Type: *Calosoma palmeri* Horn.

The subgenus *Paracalosoma* was described by Breuning to accommodate a single species (*palmeri* Horn), because of its reduced wings; otherwise the species would fit in the subgenus *Blaptosoma*, but that subgenus has wingless forms.

In order to avoid repetition, this subgenus is not separately described, the main characters being given in the description of the species.

Calosoma (Paracalosoma) palmeri Horn

Figures 29, 131, 195

Calosoma palmeri HORN, 1876, p. 199. Type: Guadalupe Island in the Pacific.

DESCRIPTION: Black shining beetles, with rudimentary wings; ventral side, antennae, and parts of the mouth brown.

Head smooth, with wrinkles near eyes and at the front and in some specimens with very fine punctures in the depressions near the eyes; labrum strongly curved or almost bifurcated, smooth; mandibles rather arcuate and acute on the tip, strigose and punctate, but not rough; antennae reaching the humeri, third segment and base of fourth strongly compressed, second one less so; first segment in some examples with two setae instead of the usual one; beginning with fifth segment, antennae pubescent, some with glabrous spots at the base of the segments.

Pronotum in its widest part before the middle one and one-half times as wide as long, rather narrowed posteriorly, sides arcuate at the front and straighter behind; lateral margin narrow, apex without marginal bead, but very shining; one seta a little behind the middle of the side margin; hind angles small, narrowly rounded, and slightly projecting beyond basal line; disk smooth or finely wrinkled, with heavier wrinkles and sometimes punctures in the dimples near hind angles. Scutellum triangular, usually longer than wide, variable in size.

Elytra oval, wider at the apical part, humeri rounded, with even margin near

them; striae fine, but distinct, not punctured, but formed by fine lines; interstices flat and smooth; foveae inconspicuous.

Ventral side smooth, brownish; metasternum not longer than wide, often with a few shallow punctures; sides of abdomen with sparse punctures; last abdominal segment with four to six setae, sometimes more, on the apex (usually two or three on each side), and with or without two additional setae in the second row, closer to the middle of the segment; fourth and fifth segments with two setae each, and third segment with two longer setae in the middle of the segment and a few shorter towards sides. Metatrochanter with one seta; all tibiae straight in both sexes; anterior tarsi of male with three segments dilated and bearing a dense brush underneath. Penis thin, slightly arcuate, narrowed towards the end, with a long tip (fig. 131); gonapophyses moderately elongated, tip an obtuse angle, furrow near it with two tiny setae, base of the process and inner sides of the basal sclerites sparsely punctate and with short hair, as usual in *Calosoma* (fig. 195).

Length, 17–21 mm.; width, 7–9 mm.

DISTRIBUTION: Localized in Guadalupe Island. According to Burgess and Collins (1917), also in California and Mexico, which seem, however, to be erroneous.

This beetle is easily distinguished by the shining, smooth appearance, by the fact that the pronotum is narrowed behind, without marginal bead on the apex, and that the elytra are wider towards the apex, with fine striae composed of fine lines, and by the reduced wings. It is compared by Horn (1876) to *triste*, but the latter has a distinct marginal bead on the apex of the pronotum, punctate elytral striae, rougher sculpture, and well-developed wings.

I have examined 40 beetles of *palmeri* from Guadalupe Island and have not seen much variation in the characters, which all seem to be constant.

SUBGENUS **BLAPTOSOMA** GÉHIN

Blaptosoma GÉHIN, 1885, p. 33. Type: *Calosoma laeve* Dejean.

Aulacopterus GÉHIN, 1885, p. 34. Type: *Calosoma viridisulcatum* Chaudoir.

DESCRIPTION: Black, some specimens with brown elytra or with green stripes and spots.

Head usually stout, smooth or wrinkled, or with sparse, large punctures (*porosifrons*, *viridisulcatum*, and *atrovirens*), some specimens finely punctate (*laeve* and *haydeni*); only one seta near each eye; labrum curved, often rather strongly so, either wrinkled or smooth; mandibles varying from quite smooth, as in *porosifrons*, to deeply strigose and punctate, as in *laeve* and other species similar to it; antennae short, first segment bearing one seta, seldom two setae, third segment and base on fourth compressed, the second one only slightly so, antennae uniformly pubescent, beginning with the fifth segment, except in *haydeni* in which the fifth and sixth segments have elongated, glabrous spots, dividing the pubescent area; tooth of mentum triangular, pointed, and mostly without pore punctures.

Pronotum with sides evenly arcuate, hind angles broadly rounded, and not extending far beyond the basal line, as in the genus *Callisthenes*; lateral margin notably wider at the base (*laeve* and others), or narrow from apex to base (*microgonum*); disk smooth or with fine punctures at the base, in some individuals at apex and sides; one seta on each side in the middle of the lateral margin or a little behind the middle.

Scutellum triangular, variable in size. Elytra with rounded humeri and even margin near them in all but one species (*haydeni*), which has a serrated margin; elytral disk usually smooth.

Ventral side smooth, sides of abdomen punctate; last abdominal segment with eight or more setae on the apex, mostly without additional row of setae closer to the middle of the segment and, as usual, with one seta on each side. Some species, such as *haydeni*, having up to 20 setae on the apex of the last abdominal segment. Fourth and fifth segments usually bearing two setae each, and the third segment with two setae closer to the middle of the segment and often with some additional setae closer to the sides. Metaepisternum not longer than wide (figs. 84, 85); wings absent; metatrochanter with one seta; all tibiae straight in both sexes; anterior tarsi of male having three segments dilated and with a dense brush underneath; penis with a broadly rounded tip, inner armature ending with a hook; gonapophyses in all species more or less the same. Basal

sclerites either convex, with a sharp ridge, as in *viridisulcatum*, or hardly convex, as in *haydeni puncticolle*, the inner sides of sclerites with sparse punctures bearing short hair; the leaf-like process with a narrowly rounded tip, with an elongated, mostly deep furrow containing two tiny setae, base of the process with punctures bearing hair, dorsal side strigose (fig. 196).

Blaptosoma was first described by Géhin (1885), and later recognized by other authors [Bradley (1930), Jeannel (1940), and Blackwelder (1944)].

Jeannel (1940) placed *Blaptosoma* as a subgenus of the genus *Callitropa*. He included in it only the *laeve* group (*viridisulcatum*, *atrovirens*, *anthracinum*, *microgonum*, *porosifrons*, and *laeve*). The remaining species, which, according to Breuning (1927), also belong to this subgenus, Jeannel placed in two different genera: *Carabomimus*, including the *striatulum* group and *cicatricosum*, *flohri*, and others; and *Calopachys* with three species, *blaptoides*, *omiltemium*, and *viridissimus*. This division was made by Jeannel because of the difference in the inner armature of the penis. *Blaptosoma* has a hook at the end, *Carabomimus* has a thread-like or flag-like inner armature, and *Calopachys* has a "button" at the end.

I think that *Blaptosoma* and *Carabomimus*, *Calopachys*, and *Callitropa* are subgenera of *Calosoma*, but I would also include in *Blaptosoma* (in addition to the *laeve* group) two forms (*haydeni* Horn and *puncticolle* Bates) that were placed by Jeannel (1940) in the genus *Camedula*. These forms, which I consider conspecific, are nearer to *Blaptosoma* because they are apterous, have the same form of the pronotum and elytra, are smooth, and have other minor similar characters.

The genus *Aulacopterum* Géhin, described for *viridisulcatum* and *cosipenne*, is a synonym of *Blaptosoma*, as was shown by Breuning (1928b). Actually *costipenne* belongs in the subgenus *Carabomimus* because of the long inner armature of the penis, with no hook at the end.

The main characters of the subgenus *Blaptosoma* are: the absence of wings (consequently the metaepisternum is not longer than wide); hind angles of the pronotum extending only slightly beyond the basal line and the sides evenly arcuate; elytra oval or

oblong-oval with rounded humeri, smooth, with flat interstices; and middle tibiae straight in both sexes.

KEY TO THE SPECIES OF THE SUBGENUS

Blaptosoma GÉHIN

1. Elytra with four black, elevated ribs, and green or, in some specimens, black furrows between them; each elytron with only seven striae, two in each furrow; head with large, sparse punctures; pronotum flattened at the base. Length, 24 to 27 mm. Central Mexico, mostly in Jalisco *viridisulcatum* Chaudoir
- Elytra without elevated ribs, with 16 striae or with striae obliterated 2
- 2(1). Elytral margin near humeri serrated . . . 3
- Elytral margin near humeri even 4
- 3(2). Elytra at basal part, towards sides, with deep, transverse wrinkles; pronotum slightly narrowed posteriorly. Smaller beetles, 21 to 23 mm. Southwestern United States *haydeni haydeni* Horn
- Elytra smooth, pronotum with evenly arcuate sides; larger, 22 to 28 mm. Northern Mexico and Texas *haydeni puncticolle* Bates
- 4(2). Head with large and often sparse punctures at the front, confluent near eyes 5
- Head finely punctate or smooth 7
- 5(4). Widest part of pronotum in the middle, or close to it, dimples near hind angles inconspicuous. Smaller beetles, 16 to 22 mm. Mexico: Durango . . . *porosifrons* Bates
- Widest part of pronotum behind the middle, dimples near hind angles large. Larger beetles, 20 to 28 mm. 6
- 6(5). Elytra green, at least partly. Eastern Mexico *atrovirens atrovirens* Chaudoir
- Elytra black, often with green margin. South central Mexico *atrovirens obscurum* Géhin
- 7(4). Pronotum without apical marginal bead, lateral margin hardly, or moderately, wider at base; head very finely punctate. Length, 17 to 22 mm. Mexico: Chihuahua *chihuahua*, new species
- Pronotum with distinct marginal bead on apex 8
- 8(7). Lateral margin of pronotum notably wider at base; head finely, moderately densely punctate and wrinkled; elytra black or dark brown. Length, 20 to 28 mm. Mexico *laeve* Dejean
- Lateral margin of pronotum narrow, scarcely wider at base; head finely, densely punctate or rather wrinkled; elytra mostly reddish brown 9

- 9(8). Hind angles of pronotum small and often pointed, dimples near them inconspicuous; lateral margin rather narrow. Length, 21 to 25 mm. Mexico: Veracruz, Federal District, Puebla, Jalisco. *anthracinum microgonum* Bates
- Hind angles of pronotum rounded, dimples near them distinct; lateral margin slightly wider at base. Length, 22 to 27 mm. Mexico: Guerrero *anthracinum anthracinum* Dejean

Calosoma (*Blaptosoma*) *viridisulcatum* Chaudoir

Figures 33, 132

Calosoma viridisulcatum CHAUDOIR, 1863, p. 114. Type: Interior Mexico.

Calosoma latesulcatum OBERTHÜR, 1883, pl. 1, fig. 3. Type: "Mexico"?

Callitropa (*Blaptosoma*) *viridisulcatum laetulum* JEANNEL, 1940, pp. 212, 217. Type: Guadalajara, Jalisco.

Calosoma (*Blaptosoma*) *viridisulcatum viridilucens* BEHEIM AND BREUNING, 1943, p. 22. Type: Zacatecas.

DESCRIPTION: Black, with green luster on head and pronotum and green stripes on elytra.

Head stout, smooth, with large, sparse punctures at the front, confluent in the depression near eyes; number of punctures varying greatly from several to dozens; antennae short, but usually reaching the humeri, second, third, and base of fourth segments notably compressed, pubescent, beginning with the fifth segment, but some specimens having glabrous spots at the base of fifth and sixth segments, which seldom extend to the apex of the segments; mandibles deeply strigose and punctate.

Pronotum nearly twice as wide as long, widest behind the middle; lateral margin much wider and flattened at the base, with depressions near hind angles, which are broadly rounded and extend slightly beyond the basal line; one seta near the lateral margin, directly behind the middle; apex with a distinct marginal bead; disk a little wrinkled, sparsely punctate at base and sides, and with a few punctures at apex; all fresh beetles with a brilliant green or blush stripe on each side of the pronotum and a thin line of the same color along the apical marginal bead; punctures also green.

Elytra oblong-oval, with rounded humeri and even margin near them, with five green



FIG. 3. Distribution of *Calosoma (Blaptosoma) laeve* Dejean and *viridisulcatum* Chaudoir.

stripes on each elytron and black, elevated, convex ribs between them; usually the ribs twice as wide as the stripes; two punctured striae on the sides of each stripe and seven striae on each elytron. Dark or worn specimens with only the foveae and elytral margin green.

Ventral side black, with green luster, smooth, with a few deep punctures on metaepisternum and sides of the abdomen; last abdominal segment usually with eight setae on the apex, in some specimens up to 12, with or without additional setae in the middle of the segment; third, fourth, and fifth segments with two to four setae each, easily lost. Metatrochanter usually, but not always, bearing a seta; penis wide, slightly arcuate, broadly rounded at the tip (fig. 132); gonapophyses with narrowly rounded tip; the basal sclerites of the genitalia convex, with a distinct ridge.

Length, 24–28 mm.; width, 9–11 mm.

DISTRIBUTION: Mexico; more abundant in Jalisco, but also occurring in the adjacent states. Colima: Atenquique; Guerrero: Pacana; Jalisco: Ajijic, junction on the road to Ameca, Guadalajara, Lake Chapala, Salatiitlan, Tlaquepaque; Queretaro: Arroyo Seco; Nayarit: Tepic; Zacatecas.

Calosoma (Blaptosoma) viridisulcatum has the same punctation on the head and the same form of the pronotum as *atrovirens obscurum*, but differs considerably from it and from the other species of the subgenus in the peculiar sculpture of the elytra and in the number of striae.

This beetle was placed by Géhin (1885) in the genus *Aulacopterus*, now recognized as a synonym of *Blaptosoma*. It is a distinct species, as was proved by Jeannel (1940), and not a subspecies of *laeve*, as stated by Breuning (1928a).

The form *laetulum* Jeannel (1940) is brilliant blue and has the stripes of the elytra twice as wide as the black ribs, which are also more convex. According to Jeannel it is a subspecies, but it is found in the same locality (Guadalajara, Jalisco) as the typical form, and therefore I consider it a variety.

The *viridilusens* of Beheim and Breuning is another variation of *viridisulcatum*, with emerald green color of the body, including the head and pronotum, only the narrow elytral ribs being black. I have seen a few specimens of this variety in the Museum of Comparative Zoölogy in Cambridge and in the collection of the California Academy of Sciences. Examples from Nayarit have the pronotum not so broadly flattened at the base as is usual in *viridisulcatum*, with the widest part in the middle, and the disk much more wrinkled, especially towards the base and the sides; the hind angles of the pronotum are more prominent than in most *viridisulcatum*, and the ribs of the elytra are more convex. (In the description of *viridilusens* nothing is said about the sculpture and form of the pronotum.)

An example of *viridilusens* from Atenquique, Colima, is more like typical *viridisulcatum* than are the specimens from Nayarit. The head and the pronotum are dark, as in typical examples, the form of the pronotum is the same, and the sculpture is also smooth, but the green stripes of the elytra are much wider, and the black ribs are more convex.

MATERIAL EXAMINED: Eighty-five specimens.

Calosoma (Blaptosoma) haydeni

Black; head finely and densely punctate; mandibles deeply strigose and punctate; antennae reaching the humeri and either uniformly pubescent or with glabrous spots on the fifth and following segments. Pronotum twice as wide as long, or nearly so, with sides slightly arcuate, lateral margin notably wider and flattened at the base; hind angles broadly rounded, hardly extending beyond the basal line.

Elytra oval and convex, humeri rounded and margin near them serrated; striae finely punctate or almost obliterated; interstices flat, at the base, closer to the sides, with transverse wrinkles which in some specimens are rather deep; foveae small or absent.

Ventral side brownish black; metaepisternum with large, sparse punctures; sides of the abdomen punctate or slightly wrinkled; last abdominal segment bearing from eight to 20 setae on the apex, and in some specimens two setae, instead of one, on the sides; fourth and fifth abdominal segments with two to four setae each. Penis narrowed towards the end, with a rounded tip (fig. 133); gonapophyses with a much more rounded tip than in *viridisulcatum*, and the basal sclerites of the genitalia mostly flattened, sometimes even without distinct ridge (fig. 196).

This is a polytypic species and the only one of the subgenus *Blaptosoma* that penetrates to the United States. The subspecies *haydeni* occurs in the southwestern United States and is not very common. The subspecies *puncticolle* is quite abundant in Mexico, but rare in the United States. Apparently the two subspecies meet in Texas. I have seen *puncticolle* from Marathon and *haydeni* from Alpine, both in Brewster County, Texas.

Calosoma (Blaptosoma) haydeni is closely allied to *laeve*, but it is not a subspecies of it, as so listed by Breuning (1927), and can be easily distinguished by the serrated elytral margin near the humeri. For this reason (serrated humeri), Jeannel (1940) placed it in the subgenus *Camedula*. I think it fits better in the subgenus *Blaptosoma*, in spite of the fact that all other species of *Blaptosoma* have no serration near the humeri. *Calosoma haydeni* is apterous, has a short and wide metaepisternum and rounded humeri, and is smoother and in general more similar to the beetles of the subgenus *Blaptosoma*.

***Calosoma (Blaptosoma) haydeni haydeni* Horn**

Figure 84

Calosoma haydeni HORN, 1870, p. 69. Type: Southern Colorado.

The northern form (*haydeni*) is smaller than *puncticolle* and has more arcuate sides of the pronotum, as in some *affine*. The elytral striae are more distinctly punctate, and the base of the elytra is more wrinkled or even scaly towards the sides.

Length, 21–23 mm.; width, 8–9 mm.

RECORDS: Arizona, Colorado, New Mexico, Texas.

The beetles are usually found under rubbish in the beds of dry creeks and in the fields.

They do not occur in Mexico and are not abundant in the United States. I have seen 25 specimens from New Mexico, one from Peach Spring, Mohave County, Arizona, and one from Alpine, Brewster County, Texas.

***Calosoma (Blaptosoma) haydeni puncticolle* Bates**

Figures 31, 66, 133, 196

Calosoma puncticolle BATES, 1891, p. 225. Type: Santa Clara, Chihuahua.

Larger than *haydeni haydeni*. Sides of the pronotum only slightly arcuate, elytral striae almost obliterated, with a few punctures at the base, usually more distinct than in *laeve*, interstices finely wrinkled at the base, but not scaly as in *haydeni haydeni*. However, I have seen one beetle from Federal District, Mexico, which also had scaly elytra.

Length, 22–28 mm.; width, 7.5–10 mm.

DISTRIBUTION: Very abundant in northern Mexico. Chihuahua: Agua Caliente, Catarinas, Jimenez, Santa Barbara District, Santa Clara, San Isidro, Valle de Olivos; Coahuila: La Gloria, south of Monclova; Durango: Canelas, Cuencame, Durango City, Las Puentes, Nombre de Dios, Promontoria, Santa Maria del Oro, Villa Ocampo; Nuevo Leon: Monterrey. Also Texas: Brewster County, Marathon. Probably intergrades with *haydeni haydeni* in Texas. I have seen one specimen of *puncticolle* from Marathon and one *haydeni* from Alpine, Texas.

In Mexico *puncticolle* is very common, but it is rare in the United States, where it is replaced by *haydeni haydeni*.

MATERIAL EXAMINED: One hundred specimens.

***Calosoma (Blaptosoma) porosifrons* Bates**

Figures 35, 134

Calosoma porosifrons BATES, 1891, p. 229, pl. 13, fig. 3. Type: Refugio, Durango.

Calosoma (Blaptosoma) porosifrons laevifrons BREUNING, 1931, p. 621. Type: "Mexico."

DESCRIPTION: Black, with round oval body. Head smooth, with large and sparse punctures near the eyes and a few on the front, in some specimens more densely punctate; labrum moderately or strongly curved; mandibles short, stout, smooth, or finely strigose and punctate; antennae short, hardly reaching the humeri, second, third and base

of fourth segments compressed, base of the fifth and sixth segments in some individuals with glabrous or punctate spots.

Pronotum not quite twice as wide as long, with sides evenly arcuate; lateral margin wider and more lifted at base, apical marginal bead not always distinct; no seta on the sides (among the 60 specimens examined only three with a pore puncture indicating the place of a seta); hind angles rounded, not at all, or but slightly, produced beyond the basal line; disk smooth, without punctation.

Scutellum usually wider than long, a character common in the subgenus *Carabomimus*.

Elytra smooth, with very fine, punctate striae; interstices flat, often with fine, transverse wrinkles; three rows of shallow, green foveae present; humeral angles distinct, but rounded, margin near them even, in basal part of elytra with deep, irregular creases and green luster.

Ventral side dark brown or black, smooth, metaepisternum often with a few punctures, sides of abdomen with large punctures; last abdominal segment with usually four to six setae on the apex and no additional ones in the middle; fourth and fifth segments bearing two setae each in large pore punctures; metatrochanter with one seta; penis arcuate, slightly narrowed towards the end, tip short and rounded (fig. 134); gonapophyses with a very pointed tip, in some examples more rounded, but more slender than in *haydeni*; basal sclerites of genitalia more convex.

The males are more slender than the females and approach the size of *C. (Carabomimus) diminutum*, but are easily distinguished by the large punctures on the head.

Length of the male is 16–19 mm., width, 7–8.5 mm.; the females are 16–22 mm. long and 7–9.5 mm. wide.

DISTRIBUTION: Seems to be localized in Durango state. Coyotes, El Salto, Otinapa, Palos Colorados, Refugio, Rio Nazas, Sierra de Durango, Sierra de Madre.

In its external characters *porosifrons* resembles the subgenus *Carabomimus*, in which it was placed by Csiki (1927), but it is stouter and has a marginal bead on the apex of the pronotum (although not always a complete bead) and has quite different genitalia. It was placed by Jeannel (1940) in the genus *Callitropa* subgenus *Blaptosoma* because the penis has a hook at the end of the inner armature.

Breuning's form *laevifrons* (one female from Mexico; precise locality not indicated), with a smooth, not punctured head, green base of the pronotum, and green elytral margin is probably a smooth form of *porosifrons*. I have seen examples with as many as two to three punctures on the front of the head; as for the green color, it is common for these beetles to have a green luster on the elytral margin, on the base of the pronotum, and in the punctures of the head. I believe *laevifrons* is a synonym.

MATERIAL EXAMINED: Sixty specimens.

Calosoma (Blaptosoma) atrovirens

Large, black or green species; head more strongly punctate than in *laeve*; mandibles deeply strigose and punctate in creases; antennae short, not or hardly reaching the humeri, the second segment slightly compressed, the third and the base of the fourth strongly so; beginning with the fifth segment, antennae uniformly pubescent.

Pronotum twice as wide as long, or nearly so, the widest part behind the middle, not at the middle as in *laeve*; seta near the middle of lateral margin not always present, and the lateral margin itself much wider and flattened at the base; hind angles broadly rounded, hardly extending beyond the basal line, some specimens with shining, fine punctures at the base.

Elytra oblong-oval, with rounded humeri and even margin near them; striae very fine, almost obliterated, interstices flat, smooth or finely wrinkled. Females have stouter elytra, wider towards the apex.

Ventral side black or with green luster, proepisternum smooth, mesoepisternum, as well as metaepisternum and sides of the abdomen, punctate, the mesoepisternum in some specimens densely so.

Jeannel (1940) divided *atrovirens* into three subspecies: *atrovirens*, *obscurum*, and *explanaticolle*, of which I recognize the first two, *explanaticolle* being a synonym. The first occurs in eastern Mexico, and *obscurum* in western, central, and southern Mexico. Bates (1891) placed *obscurum* as a variation of *atrovirens* and thought that *atrovirens* was so similar to *laeve* that they could hardly be distinguished. This is not quite so, because

atrovirens is distinguishable from *laeve* by the larger punctures on the head, by the broadly flattened base of the pronotum, and by the green luster on the elytral margin or on the entire upper side of the body.

Calosoma (Blaptosoma) atrovirens atrovirens

Chaudoir

Figure 135

Calosoma atrovirens CHAUDOIR, 1869a, p. 372. Type: "Mexico."

DESCRIPTION: Black, with green upper side, at least partly, and with green luster on the ventral side. Entire head more densely and often more finely punctate than in *atrovirens obscurum*. Mesoepisternum and metaepisternum mostly with a dense punctation; last abdominal segment bearing up to 14 setae on the apex, and some additional ones on the sides, but not in a second row, closer to the middle of the segment; fourth and fifth segments with two setae each. Penis large, narrowed towards the end, with a more slender tip than in *obscurum*, much thinner than in *viridisulcatum* or even in *laeve* (fig. 135); gonapophyses as in *haydeni puncticolle*, but the base of the leaf-like process broader, and the tip of the process more pointed, and certainly more pointed than in *obscurum*.

Length, 23–30 mm.; width, 8.5–11 mm.

DISTRIBUTION: Eastern Mexico. Hidalgo: Tula; Tamaulipas: northwest of Ciudad del Maiz.

Breuning (1927) listed *atrovirens* as a subspecies of *laeve*, but Jeannel (1940), who examined the types of both *atrovirens* and *obscurum*, proved that they were different species from *laeve*.

MATERIAL EXAMINED: Six specimens.

Calosoma (Blaptosoma) atrovirens obscurum

Géhin

Figures 65, 136

Calosoma obscurum GÉHIN, 1885, p. 65. Type: Oaxaca.

Calosoma explanaticolle BATES, 1891, p. 225. Type: Tupatario, Guanajuato.

DESCRIPTION: Black, often with green luster on the sides of the head and elytral margin. Head with sparser punctation than in *atrovirens atrovirens* and with deep wrinkles in the impressions near the eyes, some specimens having the front almost without punc-



FIG. 4. Distribution of *Calosoma* (*Blaptosoma*) *haydeni puncticolle* Bates, *atrovirens atrovirens* Chaudoir, and *atrovirens obscurum* Géhin.

tures. Ventral side brownish black, smooth, metaepisternum with a few shallow punctures, sides of abdomen with deeper punctations; last abdominal segment bearing from six to 10 setae on apex and no additional ones in the middle or sides; fourth and fifth segments having two to four setae each. Penis as in *viridisulcatum*, wide, arcuate, hardly narrowed towards the end, with a broadly rounded tip (fig. 136); gonapophyses as in *haydeni puncticolle*, but the tip of the leaf-like process more rounded, and also more rounded than in *atrovirens atrovirens*.

Length, 20–27 mm.; width, 8–10 mm.

DISTRIBUTION: Southwestern and central parts of Mexico. Guanajuato: Tupatario; Jalisco: Chapala, El Refugio, Sahuayo, west of Tepatitlan; Michoacan: Jacona, Jiquilpan, San Jose de Gracia; Oaxaca; Puebla; Zacatecas: Laguna Balderama.

Breuning (1928b) listed *obscurum* as a synonym of *atrovirens* and the latter as a subspecies of *laeve*. He literally united under the name of *laeve* all large Mexican *Calosoma*. Jeannel (1940) considered both *explanaticolle* and *obscurum* as subspecies of *atrovirens*. Al-

though I have not seen the types, I think that *explanaticolle* (type, Tupataro) and *obscurum* are the same forms. The differences given by Jeannel (shorter and wider pronotum in *obscurum*) are very relative.

MATERIAL EXAMINED: Twenty specimens.

***Calosoma (Blaptosoma) chihuahua*, new species**

Figures 34, 85, 137

This species is similar to *laeve* and *porosifrons*; at the same time it has many characters in common with the subgenus *Carabomimus*, but by its genitalia it definitely belongs in *Blaptosoma*.

DESCRIPTION OF TYPE, MALE: Black, shining; head finely wrinkled and very finely sparsely punctate, especially near the eyes, which are slightly projecting and have no impressions near them (a character also found in the subgenus *Carabomimus*); labrum moderately curved and wrinkled; mandibles stout, at the base strigose, towards the tip smoother; last segment of maxillary palpi only a little shorter, but notably wider than the preceding segment; tooth of the mentum triangular, pointed; antennae, as usual in *Blaptosoma*, short and uniformly pubescent, beginning with the fifth segment.

Pronotum a little less than twice as wide as long, widest part in the middle; sides evenly arcuate, lateral margin only slightly wider at the base, with one seta in the middle; apex destitute of marginal bead (another character common in *Carabomimus*, all *Blaptosoma* having a distinct marginal bead, except *porosifrons* which has a more flattened bead, in some specimens even disappearing in the middle); hind angles broadly rounded, scarcely extending beyond the basal line; dimples at the base absent, disk slightly convex, finely wrinkled and very finely punctate at the base, sides, and apex.

Scutellum wider than long, as in the subgenus *Carabomimus*. Elytra oblong-oval, humeri rounded, margin near them even; striae finely punctured, almost obliterated; interstices flat, smooth, with extremely fine wrinkles; foveae inconspicuous.

Ventral side rougher than usual in *Blaptosoma*, proepisternum smooth, mesoepisternum sparsely punctate, metaepisternum and sides of the abdomen more densely punctate and wrinkled; last abdominal segment bear-

ing four setae on the apex and no additional ones in the middle; fourth and fifth segments with two setae each; metatrochanter lacking seta, which probably has fallen off; all tibiae straight, anterior tarsi having three segments dilated and a dense brush underneath; penis of the *laeve* type, but more slender, gradually narrowing towards the end, with a rounded tip, inner armature with a hook (fig. 137).

Length, 19.5 mm.; width, 7 mm.

FEMALE: Same as male, but longer and stouter, length 22 mm., width 8.5 mm.; leaf-like process of genitalia narrowly rounded at tip, with a deep, elongated furrow close to it, bearing no seta; at the base the process is punctate, punctures with short hair, dorsal side rugose; basal sclerites of genitalia slightly convex, sparsely punctate, and with short hair on the inner sides and on the ridge.

TYPE MATERIAL: Holotype male, allotype female, paratypes (three males and four females), from Madera, Chihuahua, Mexico, July 6, 1947, at 7200 feet, collected by W. J. Gertsch, the David Rockefeller Mexican Expedition, in the collection of the American Museum of Natural History.

The paratypes vary from 17 to 22 mm. in length and from 6.5 to 8.5 mm. in width. Some of the paratypes differ from the type by having the sides of the pronotum and elytral margin with bluish or violet luster and two or three setae in the middle of the lateral margin of the pronotum; the head in some examples is more densely punctate than in the type, and the mandibles are nearly smooth; the apex of the last abdominal segment may have as many as eight setae; metatrochanter with one seta.

MATERIAL EXAMINED: Nine specimens.

***Calosoma (Blaptosoma) laeve* Dejean**

Figures 30, 138

Calosoma laeve DEJEAN, 1826, p. 210. Type: "Mexico."

Calosoma chevrolati DEJEAN, 1837, p. 25. Type: "Mexico."

DESCRIPTION: Black, often with dark brown elytra. Head finely punctate at the front, wrinkled and more densely punctate in the impressions near eyes; labrum rather curved and wrinkled; antennae short, but usually reaching the humeri, second, third

and base of fourth segments compressed, uniformly pubescent, beginning with fifth segment, very seldom with indistinct glabrous spots at the base of the fifth and sixth segments.

Pronotum not quite twice as wide as long, the widest part in the middle, sides evenly arcuate, lateral margin moderately wider towards the base and with one seta near the middle; apex with a distinct marginal bead; hind angles broadly rounded and slightly extending beyond the basal line; dimples near them distinct; disk smooth or finely wrinkled, with fine punctures at the base, often on sides and apex, but some individuals having no punctures at all.

Elytra oblong-oval, with rounded humeri and even margin near them; only traces of striae; interstices flat, in some specimens finely wrinkled or with fine punctures at the base; foveae inconspicuous.

Ventral side smooth, metaepisternum with a few shallow punctures, sides of abdomen slightly wrinkled and also with a few punctures; last abdominal segment bearing up to 10 setae on the apex, and no additional ones closer to the middle; fourth and fifth segments with two, seldom four, setae each; middle and hind tarsi sparsely, finely punctate, anterior tarsi with only a few fine punctures at the basal part; penis wide, slightly arcuate, with a rounded tip (fig. 138); gonapophyses as in *atrovirens obscurum*, the tip of leaf-like process rounded, not pointed even in fresh beetles; basal sclerites of genitalia slightly convex, less so than in *viridiscalcatum*, which has them convex and with a sharp ridge.

Length, 20–28 mm.; width, 7.5–9.5 mm.

DISTRIBUTION: More abundant in the southern and central parts of Mexico but penetrates to the extreme north of the country. Chihuahua: Pedernales; Federal District: Mexico City, San Juan, Tacubaya; Hidalgo: Guadalupe, Tulcingo; Nuevo Leon: Alta Vista; Mexico: Chapingo; Michoacan: Cuitzeo, Morelia; Morelos: Cuernavaca; Puebla: Cacaloapan, Cholula, Puebla City; Veracruz: Perote.

Calosoma chevrolati Dejean is a synonym of *laeve*, as proved by Breuning (1928b) and Jeannel (1940).

There are several large species of the subgenus which are like *laeve*, such as *anthraci-*

num, *haydeni*, *atrovirens*, and some others, and probably this fact induced Breuning (1927, 1928b) to unite under the name of *laeve* all large Mexican *Calosoma*. Actually *laeve* is more like *anthracinum* and *atrovirens obscurum*, but it differs from the first in the wider pronotum, with the lateral margin broader towards the base, in the darker color of the elytra, and in the wider penis; from the second (*atrovirens obscurum*), in the finer punctation of the head, more evenly arcuate sides of the pronotum, with lateral margin less flattened at the base, and in the penis, which is narrower at the end, with a thinner tip.

Calosoma laeve varies in size, in sculpture, and in the width of the basal part of the lateral margin of the pronotum, especially in specimens that are collected in different localities. The forms from Guadalupe, Hidalgo, are small and smooth, but those from San Juan in the Federal District are much larger, and those from Chihuahua are more roughly and densely punctate on the base and sides of the pronotum.

MATERIAL EXAMINED: Thirty-five specimens.

Calosoma (Blaptosoma) anthracinum

DESCRIPTION: Narrower than *laeve*, black, with reddish brown elytra. Head finely punctate and often wrinkled, mostly at the front and near eyes; mandibles very rough, deeply strigose, and punctate in creases; antennae short, hardly reaching the humeri.

Pronotum narrow, not more than one and one-half times as wide as long, the widest place in the middle; sides evenly, slightly arcuate; lateral margin narrower than in *laeve*, scarcely wider at the base; hind angles small, extending very little beyond the basal line; disk often wrinkled, the base punctate.

Elytra oblong-oval, smooth, with parallel sides; humeri rounded and margin near them even; striae fine, interstices flat, foveae inconspicuous.

Ventral side dark brown and smooth; metaepisternum with sparse, shallow punctures, in some specimens punctate and wrinkled; last abdominal segment usually bearing eight setae on the apex; fourth and fifth segments with two setae each; sides of abdomen more densely punctate than usual in *laeve*; penis seems to be more slender, with

a narrower tip (fig. 139); gonapophyses as in *atrovirens obscurum*.

This is a polytypic species with two subspecies, *anthracinum anthracinum* and *anthracinum microgonum*. Both occur in Mexico.

Breuning (1928b) placed *anthracinum* as a synonym (aberration) of *laeve*, and *microgonum* as its subspecies. Jeannel (1940), who examined the specimens of *anthracinum* determined by Bates, thinks that they are different species. *Calosoma* (*Blaptosoma*) *anthracinum* is closer to *microgonum*, and apparently Jeannel was right to place them as subspecies. Both differ from *laeve* in the narrower pronotum, with lateral margin hardly wider towards the base. They also occur in some of the same localities as *laeve*. Actually *anthracinum anthracinum* seems to occupy a position between *laeve* and *anthracinum microgonum*, but is more like the latter.

***Calosoma* (*Blaptosoma*) *anthracinum anthracinum* Dejean**

Calosoma anthracinum DEJEAN, 1831, p. 569.
Type: "Mexico."

Calosoma rufinum GÉHIN, 1885, p. 66. Type: "Mexico."

Larger than *anthracinum microgonum*, with

wider elytra. Lateral margin of the pronotum wider at the base; hind angles rounded and dimples near them conspicuous.

Length, 22–27 mm.; width, 8–10 mm.

DISTRIBUTION: Recorded only from Amula, Guerrero, Mexico.

I have seen only four specimens.

Calosoma rufinum Géhin, as shown by Jeannel (1940) and Breuning (1928b), is a synonym of *anthracinum anthracinum*.

***Calosoma* (*Blaptosoma*) *anthracinum microgonum* Bates**

Figures 32, 139

Calosoma microgonum BATES, 1891, p. 225.
Type: Jalapa, Veracruz.

Smaller and narrower than *anthracinum anthracinum*; pronotum as in *Carabomimus striatulum*, with very narrow lateral margin, hardly wider towards base, and with slightly arcuate sides, but apical marginal bead, which is absent in the subgenus *Carabomimus*, very distinct in *anthracinum microgonum*; hind angles pointed and dimples near them absent.

Length, 21–25 mm.; width, 7–9.5 mm.

DISTRIBUTION: This subspecies seems to be not very common; it occurs in the south-

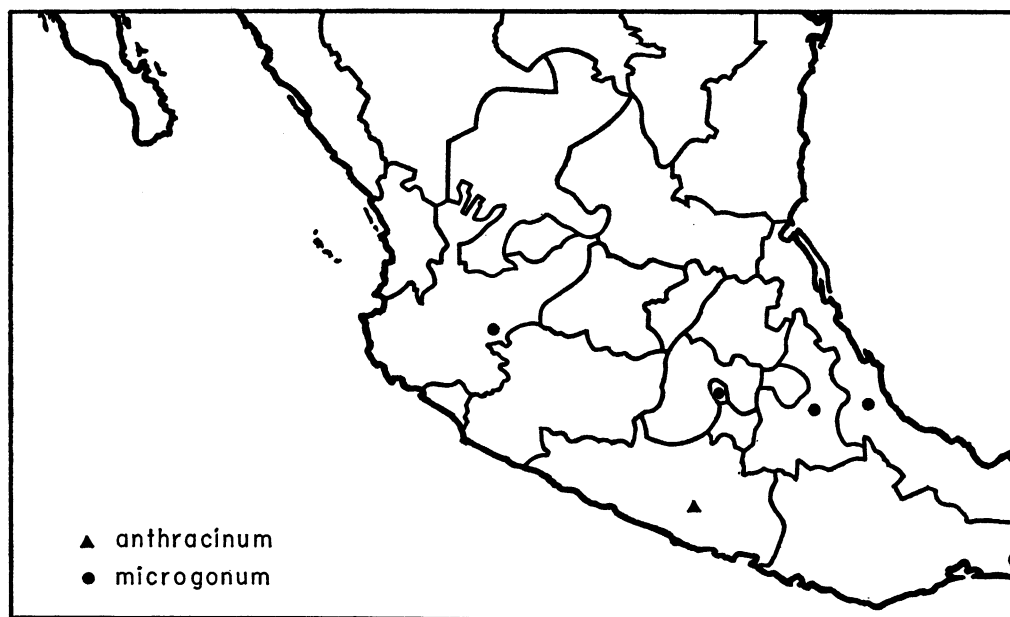


FIG. 5. Distribution of *Calosoma* (*Blaptosoma*) *anthracinum anthracinum* Dejean and *anthracinum microgonum* Bates.

ern and central parts of Mexico. Federal District: Mexico City; Jalisco: Chalapa; Puebla: Esperanza; Veracruz: Jalapa.

MATERIAL EXAMINED: Sixteen specimens.

SUBGENUS CARABOMIMUS KOLBE

Carabomimus KOLBE, 1895, p. 57. Type: *Calosoma striatulum* Chevrolat.

DESCRIPTION: Black or dark brown; head smooth, without or with very shallow depressions near the eyes; some species having fine or larger punctures at the front; labrum with a more or less strongly curved margin; mandibles smooth or finely strigose; last segment of maxillary palpi shorter than the preceding; antennae mostly short, hardly reaching the humeri, third segment and base of the fourth not always distinctly compressed, uniformly pubescent, beginning with the fifth segment.

Pronotum a little less than twice as wide as long, with feebly, evenly arcuate sides, or straighter posteriorly; lateral margin thin and not at all, or only a little, wider at the base, more notably in *gebieni*; hind angles rounded and extending slightly or decidedly (*depressicolle*, *asper*) beyond the basal line; apex of pronotum destitute of marginal bead, or occasionally with one incomplete, broken in the middle; disk smooth, finely punctate, usually at the base, and wrinkled; one species (*flohri*) with the disk punctured; pronotum feebly convex or flat, with one seta in the middle of the lateral margin.

Scutellum wide and short, triangular, often with rounded tip, but, as always in *Calosoma*, varying greatly in size. Elytra oblong-oval or round-oval, with rounded humeri and even margin near them; sculpture variable; striae obsolete (*laevigatum*, *politum*, and *diminutum* finely, densely punctured (*striatulum*), or confused and the interstices sprinkled with large punctures (*asper*, *flohri*, and others).

Ventral side smooth, sides of the abdomen punctate; last abdominal segment bearing up to eight setae on the apex (four on each side), in some specimens two additional setae in the second row, closer to the middle of the segment. The absence or presence of these additional setae is an infraspecific variation in all species of *Carabomimus*. The fourth and fifth abdominal segments almost always have two setae each. However, *diguetti* in some speci-

mens has as many as six, but the third segment may have more than two setae. Metaposternum not longer than wide; wings absent; anterior tarsi of male with three segments dilated and bearing a dense brush underneath. Penis arcuate, often not symmetrical, with elevations near the apex, tip rounded or enlarged, inner armature in the form of a flag or a thread (figs. 140–152); genitalia of females with depressions on the inner sides of the basal sclerites which, in some species (*diguetti*, *asper*, and *flohri*) are distinct and deep, in others (*striatulum*, *politum*, and *diminutum*) shallow, hardly visible; leaf-like process narrowly rounded or pointed on the tip, and in some species (*flohri*, *asper*) slender, in others stouter, usually much wider at the base (fig. 197).

Comparatively small beetles, seldom more than 22 to 24 mm.

The subgenus *Carabomimus* was described by Kolbe in 1895 for *striatulum*, *politum*, *depressicolle*, and *cicatricosum*. Later Breuning (1927) placed *Carabomimus* as a synonym of *Blaptosoma*. It is true that they have many common characters, but they differ greatly in the form of the penis; the inner armature is thread- or flag-like in *Carabomimus* and ends with a hook in *Blaptosoma*. In addition the females in *Carabomimus* have depressions on the inner sides of the basal sclerites of the genitalia, a character not known in other subgenera of *Calosoma*. In addition to the difference in the genitalia the beetles of *Carabomimus* have external characters which divide them from *Blaptosoma* and other subgenera, the main ones of which are: (1) pronotum destitute of apical marginal bead and with a narrow lateral margin, and (2) scutellum short and wide. However, *Blaptosoma porosifrons* and *Blaptosoma chihuahua* also have a wide scutellum, and in some specimens an incomplete or absent marginal bead, and they both are more like *Carabomimus* in almost every respect except the genitalia.

Because of the form of the genitalia or, to be exact, because of the different form of the inner armature of the penis, Jeannel (1940) united these beetles in one subgenus, *Carabomimus* (genus, according to Jeannel), which includes the following species: *gebieni* Breuning, *orizabae* Jeannel, *diguetti* Lapouge, *diminutum diminutum* Bates, *diminutum more-*

lianum Bates, *politum* Chaudoir, *costipenne* Chaudoir, *laevigatum laevigatum* Chaudoir, *laevigatum hogei* Breuning, *striatulum striatulum* Chevrolat, *striatulum striatipenne* Chaudoir, *striatulum cicatricosum* Chaudoir, *depressicolle depressicolle* Chaudoir, *depressicolle asper* Jeannel, *depressicolle lesnei* Breuning, *depressicolle altipeta* Jeannel, and *depressicolle flohri* Bates. The same classification was adopted by Blackwelder (1944), except for *gebieni* which was left by him in the subgenus *Blaptosoma*. I follow Jeannel, but only partly. I think that some of the Jeannel subspecies, such as *flohri*, *cicatricosum*, *asper*, *morelianum*, and *striatipenne*, are separate species; they all were collected in the same localities or in localities nearby.

All species of *Carabomimus* come from Mexico.

KEY TO THE SPECIES OF THE SUBGENUS
Carabomimus KOLBE

1. Pronotum with slightly arcuate sides, or a little narrowed posteriorly; hind angles extending slightly beyond basal line; antennae short, usually not reaching far beyond humeri (except in *diguetti*) 2
 - Pronotum narrowed posteriorly; hind angles extending distinctly beyond basal line; antennae longer, always reaching beyond humeri. 13
- 2(1). Elytra smooth, with flat interstices, without elevations of any kind. 3
 - Elytra with rough sculpture, often with convex interstices or with well-elevated ribs. 10
- 3(2). Body elongated, elytra three times as long as wide, lateral margin of pronotum narrow; surface smooth. Length, 26 mm. Veracruz *orizabae* Jeannel
 - Body shorter, elytra less than three times as long as wide. 4
- 4(3). Lateral margin of pronotum much wider at base; last segment of maxillary palpi three times as long as wide; black, smooth beetles. Length, 19–20 mm. Michoacan *gebieni* Breuning
 - Lateral margin of pronotum narrow, hardly wider at base; last segment of maxillary palpi twice or less than twice as long as wide. 5
- 5(4). Elytra with distinct striae and flat or slightly convex interstices. Length, 15–20 mm. Puebla, Veracruz, Guerrero *striatulum* Chevrolat
 - Elytra with very fine striae, or striae obliterated 6
- 6(5). Larger beetles (20–25 mm.), with rather convex elytra; antennae long, reaching beyond humeri; pronotum slightly narrowed behind. Jalisco, Zacatecas. *diguetti* Lapoue
 - Smaller beetles, seldom more than 22 mm.; elytra less convex; antennae short, hardly reaching humeri; pronotum with sides evenly arcuate . . . 7
- 7(6). Lateral margin of pronotum slightly wider at base, its sides straighter posteriorly. Length 17–23 mm. Jalisco *laevigatum hogei* Breuning
 - Lateral margin of pronotum narrow from apex to base, its sides evenly arcuate. . . 8
- 8(7). Larger beetles (17–23 mm.); body slender; penis enlarged at apex (fig. 141). Hidalgo, Veracruz, Durango, Puebla *laevigatum laevigatum* Chaudoir
 - Smaller beetles (15–21 mm.); body stouter; penis slightly narrowed at apex (figs. 142, 143). 9
- 9(8). Elytra oval and narrower; foveae mostly absent. Length, 16–21 mm. Mexico *politum* Chaudoir
 - Elytra round oval; foveae usually present. Length, 15–18 mm. Mexico *diminutum* Bates
- 10(2). Elytra with seven convex ribs and traces of striae in furrows between them. Length, 15–18 mm. Mexico, Hidalgo, Guerrero *costipenne* Chaudoir
 - Elytra without elevated ribs, interstices convex or flat, often sprinkled with large punctures; elytral striae deep . . 11
- 11(10). Shorter and stouter beetles; elytra round-oval, striae deep, regular or slightly confused, interstices with scattered punctures. Length, 13–17 mm. Federal District, Morelos, Veracruz. *morelianum* Bates
 - Slender and larger beetles; elytra oblong-oval. Length, 17–22 mm. 12
- 12(11). Elytral striae regular or slightly confused, interstices with deep, transverse creases or wrinkles, especially at base and sides; head smooth, without punctation. Puebla, Veracruz. *striatipenne* Chaudoir
 - Elytral striae confused because of scattered punctures and dimples; head finely, not densely punctate. Mexico *cicatricosum* Chaudoir
- 13(1). Pronotum with large, sparse punctures, confluent on sides and base; elytra with irregular, scattered punctures and dim-

- ples; striae slightly confused. Length, 18–22 mm. Mexico, Michoacan.
 *flohri* Bates
 Pronotum smooth, often with fine punctation on base and sides. 14
- 14(13). Pronotum strongly heart shaped; elytra with deep, regular striae; upper part of body blue-violet. Length, 17–20 mm. Jalisco . *bulleri* Beheim and Breuning
 Pronotum moderately narrowed posteriorly; black beetles. Length, 17–22 mm. 15
- 15(14). Elytral striae regular, interstices flat or slightly convex, without scattered punctures or dimples, in some specimens with a few on the sides only; foveae large. Mexico . *depressicollis* Chaudoir
 Elytral striae slightly confused near apex, deeper; interstices convex, with large, scattered punctures; foveae not always conspicuous 16
- 16(15). Pronotum with narrowly rounded hind angles; penis with pointed tip (fig. 149). Mexico *altipeta* Jeannel
 Pronotum with more broadly rounded hind angles; penis with rounded tip (fig. 148); Federal District, Mexico, Morelos, Veracruz . . . *asper* Jeannel

***Calosoma (Carabomimus) orizabae* Jeannel**

Carabomimus orizabae JEANNEL, 1940, pp. 222, 226. Type: Orizaba, Veracruz.

I have not seen this species, so I prefer to give the original description.

DESCRIPTION (TRANSLATED): "Like *gebieni* in form, but larger. Black, shining, wingless. Head normal, front smooth, without any particular prominence. Pronotum hardly transverse, base large, sides evenly rounded all along their length, hind angles large and slightly projecting. Disk regularly convex, without any basal depression, absolutely smooth, basal border thick and swollen. Elytra narrow and long, three times longer than wide, without humeral angles, smooth, without traces of striae. Secondary sexual characters normal. Penis long and slim, slightly arcuate, apical part flattened; apex well developed, long and hatchet like; inner armature of the same type as in the preceding [*diguetti*], but reduced, the tip short, not thinned.

"Rather remarkable by its elongated form. This species is certainly localized on the slopes of the great volcano of Orizaba."

***Calosoma (Carabomimus) gebieni* Breuning**

Blaptosoma laeve gebieni BREUNING, 1928b, p. 46. Type: Patzcuaro, Michoacan.

I have not seen this species, so I give the original description.

DESCRIPTION (TRANSLATED): "Head with a few punctures near the eyes; mandibles slightly strigose; tooth of the mentum without pore punctures; thorax smooth, without punctation, or with a few punctures in the pits; elytral sculpture more or less disappearing; anterior tibiae absolutely not rugose or only with traces of creases. Color black throughout, or only the elytra reddish brown. Length, 19–20 mm."

DISTRIBUTION: "Patzcuaro, Michoacan, Mexico."

"One male in the collections of the Museum in Hamburg and one in the possession of Breuning."

Breuning (1928b) assumed *gebieni* to be a race of *laeve*, but Jeannel (1940), who examined the two original specimens, stated that the type represents a distinct species and is not a subspecies of *laeve*, but that the cotype is a small example of *laeve*. According to Jeannel, the inner armature of *gebieni* is thread-like, which proves that it belongs in the subgenus *Carabomimus*, not in *Blaptosoma*.

***Calosoma (Carabomimus) striatulum* Chevrolat**

Figures 36, 140

Calosoma striatulum CHEVROLAT, 1835, fasc. 7, p. 165. Type: Perote, Veracruz.

DESCRIPTION: Black or brownish black, elytra reddish. Head smooth or very finely wrinkled, with rather shallow impressions near the eyes, in some specimens with a few fine punctures; labrum moderately or slightly curved at margin; mandibles stout and smooth or very finely strigose and punctate at the base; second, third, and base of the fourth antennal segments lightly compressed.

Pronotum flat, more than one and a half times as wide as long; sides feebly, evenly arcuate; lateral margin thin from apex to base; hind angles broadly rounded and hardly extending beyond basal line; apex without marginal bead or with only traces of it; disk smooth or finely wrinkled.

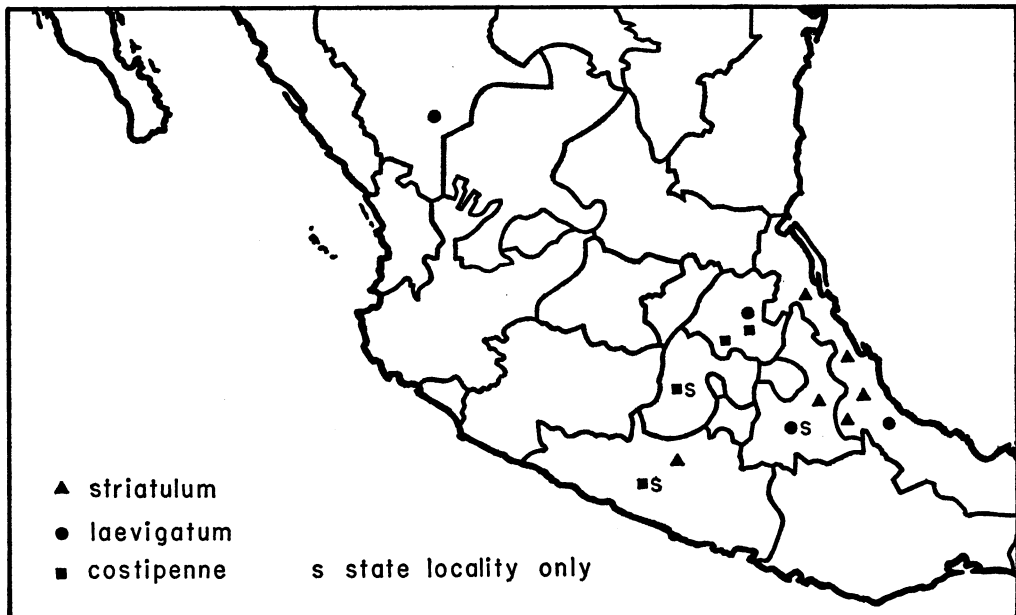


FIG. 6. Distribution of *Calosoma (Carabomimus) striatulum* Chaudoir, *laevigatum* Chaudoir, and *costipenne* Chaudoir.

Elytra oblong-oval, with fine, regular striae, often obliterated towards apex and sides; shallow foveae often visible on the fourth and eighth interstices, which are flat.

Ventral side smooth, sides of abdomen occasionally finely wrinkled; metatrochanter with one seta, in some specimens with two setae. Penis scarcely narrowed towards the apex and with enlarged, hatchet form of tip (fig. 140).

In females basal sclerites of genitalia with shallow and short depressions, not always distinct, and a few scattered punctures with short hairs; leaf-like process rounded, sometimes more pointed on the tip, furrow near it shorter than in most *Carabomimus*, but setae in furrow long, not quite reaching the tip of the process.

Length, 15–20 mm.; width, 6–8 mm.

DISTRIBUTION: Occurs in the southern and central states of Mexico. Guerrero: La Venta; Puebla: Esperanza; Veracruz: Jalapa, Las Vigas, Orizaba, Perote.

Calosoma (Carabomimus) striatulum has many closely related species, but it differs from all of them in the fine, punctate elytral striae; *laevigatum*, *politum*, and *diminutum* have obliterated striae; *cicatricosum*, *striatipenne*, and *morelianum* have rough elytral sculpture.

MATERIAL EXAMINED: Forty-one specimens.

***Calosoma (Carabomimus) striatipenne* Chaudoir**
Figure 151

Calosoma striatipenne CHAUDOIR, 1869a, p. 373. Type: Puebla, Mexico.

Calosoma dubitatum GÉHIN, 1885, p. 66. Type: "Mexico."

DESCRIPTION: Black or dark brown; head smooth or finely wrinkled, without or with very shallow impression near the eyes; labrum slightly curved at margin; mandibles smooth or very lightly strigose near the base.

Pronotum with feebly, evenly arcuate sides and thin lateral margin; disk flat, smooth or finely wrinkled; hind angles broadly rounded, extending a little beyond basal line.

Elytra oblong-oval, striae deep, usually not confused; punctures of adjacent striae connected by transverse lines which in some specimens become very deep, forming creases, deeper than the striae themselves; interstices convex, foveae inconspicuous.

Ventral side smooth; metaepisternum with a few shallow punctures and wrinkles; first abdominal segment and sides of the following segments wrinkled and punctate; male and female genitalia as in *striatulum* (fig. 151).

Length, 17–20 mm.; width, 7–8 mm.

DISTRIBUTION: Southeastern states of Mexico. Puebla: Puebla City; Veracruz: Jalapa, Orizaba.

Very similar to *striatulum*, but easily distinguished by the rough sculpture of the elytra, with convex interstices and deep, transverse wrinkles or creases at the basal part of the elytra. Breuning and Jeannel placed *striatipenne* as a subspecies of *striatulum*, but both forms are found in the same localities (Puebla and Veracruz), and they are also easily separated morphologically.

I have examined 10 specimens, and I think that *laevigatum*, which is placed by Jeannel (1940) as a separate species, is more like *striatulum* than *striatipenne*.

Some specimens of *striatipenne* with brown elytra and very deep striae were described by Géhin (1885) as *dubitatum*, which is considered by Breuning (1928b) to be a synonym.

Calosoma (Carabomimus) laevigatum

DESCRIPTION: Resembles *striatulum*, but smoother, with obliterated striae of the elytra; black or brownish black. Head smooth or finely wrinkled; labrum curved at margin; mandibles nearly smooth; antennae with third segment and base of fourth not always distinctly compressed.

Pronotum one and a half times as wide as long, sides feebly arcuate, lateral margin narrow or more flattened at base; hind angles small, broadly rounded, extending scarcely beyond the basal line; disk smooth or slightly wrinkled.

Elytra oblong oval, striae obliterated, interstices flat; foveae very small or absent.

Ventral side smooth or wrinkled, sides of abdomen punctate, last segment wrinkled; penis of the same form as in *striatulum* (fig. 141); gonapophyses also very much as in *striatulum*, but the tip of the leaf-like process mostly pointed and base of the process more densely punctate.

Calosoma (Carabomimus) laevigatum laevigatum CHAUDOIR

Figure 141

Calosoma laevigatum CHAUDOIR, 1869a, p. 374. Type: "Mexico."

Calosoma nitidum GÉHIN, 1885, p. 66. Type: "Mexico."

According to Jeannel (1940), differs from

subspecies *hogeii* in more rounded sides of the pronotum, with a narrow lateral margin. Some large forms also recall *laeve*, but are easily distinguished by the form of the pronotum, with a narrow lateral margin and without distinct apical marginal bead, and, of course, by the genitalia.

Length, 17–23 mm.; width, 6.5–8.5 mm.

DISTRIBUTION: This subspecies is not common but seems to be more abundant in the southeastern states of Mexico than elsewhere. Durango; Guanajuato; Hidalgo: Ajacuba, Real del Monte; Puebla: Sierra Negro; Veracruz.

Breuning (1927) listed *laevigatum* as a subspecies of *striatulum*, but Jeannel (1940) placed it as a separate species, which is readily distinguished from *striatulum* by the smooth, shining elytra with obliterated striae.

Calosoma nitidum Géhin, according to Breuning (1928b), is a small specimen of *laevigatum* and therefore a synonym.

MATERIAL EXAMINED: Ten specimens.

Calosoma (Carabomimus) laevigatum hogeii Breuning

Calosoma (Blaptosoma) cicatricosum hogeii BREUNING, 1928b, p. 53. Type: Guadalajara, Jalisco.

I have not seen this subspecies, so I give the original description.

DESCRIPTION (TRANSLATED): "*Hogeii* differs [from *cicatricosum*] in [being of] slightly larger, more convex form. Head and pronotum quite smooth, without punctures or wrinkles; the sides of abdomen sparsely punctate. Elytral sculpture almost regular, all intervals are conspicuous, confused only towards sides. Length, 20–21 mm.; research material (three specimens) in my collection. Distribution: Jalisco, Guadalajara."

According to Jeannel (1940), who saw the type form, *hogeii* is a subspecies not of *cicatricosum* but of *laevigatum*, and it differs from the latter in the less rounded sides of the pronotum, slightly flattened at the base.

Calosoma (Carabomimus) politum Chaudoir Figure 142

Calosoma politum CHAUDOIR, 1869a, p. 373. Type: Toluca, Mexico.

DESCRIPTION: Brownish black or black; head smooth, without or with very shallow

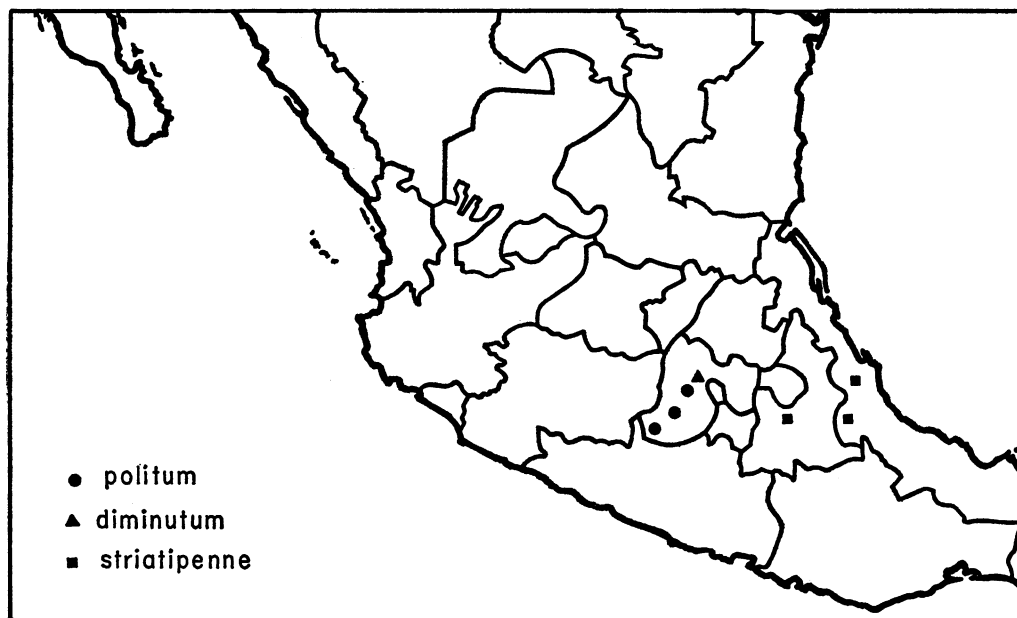


FIG. 7. Distribution of *Calosoma* (*Carabomimus*) *politum* Chaudoir, *diminutum* Bates, and *striatipenne* Chaudoir.

depressions near the eyes; labrum moderately or slightly curved at margin; mandibles more or less stout, smooth or finely strigose at the base; antennae with third segment and base of fourth rather compressed.

Pronotum not convex, about one and a half times as wide as long, with sides feebly, evenly arcuate; hind angles broadly rounded, slightly extending beyond the basal line, dimples near them inconspicuous; disk smooth or very finely wrinkled.

Elytra oblong-oval, seldom more rounded; surface absolutely smooth or hardly wrinkled with traces of striae; interstices flat, foveae mostly absent, but in some specimens shallow ones present.

Ventral side dark brown, smooth, sides of abdomen with a few shallow punctures. Penis slightly arcuate, with broadly rounded tip (fig. 142); gonapophyses as in *striatulum*, but furrow near tip of leaf-like process elongated and deep, setae in it tiny, sometimes inconspicuous; depressions on inner sides of basal sclerites as shallow as in *striatulum*.

Length, 13.5–21 mm.; width, 5–8.5 mm.

DISTRIBUTION: Seems to be localized in the state of Mexico, where it has been recorded from Real de Arriba, Temascaltepec, Tenango del Valle, and Toluca.

Very similar to *diminutum*. In a series of examples it is not difficult to pick out *politum*, which is a little more slender than *diminutum* and usually has no elytral foveae. The penis in *politum* seems to be a little stouter, but this difference is not always distinct; the female genitalia also seem to be slightly different, the depressions on the inner sides of the basal sclerites being shallower, and the tip of the leaf-like process not so pointed.

Some large examples of *politum* are also like *laevigatum*, but the latter has a more slender body, longer elytra, and the tip of the penis as in *striatulum*, more prominent and slightly truncate at the end (fig. 142).

MATERIAL EXAMINED: Twenty-three specimens.

Calosoma (*Carabomimus*) *diminutum* Bates

Figures 37, 143

Calosoma diminutum BATES, 1891, p. 227, pl. 13, fig. 2. Type: Salazar, Mexico.

Callisthenes laevissimus CASEY, 1920, p. 170. Type: Salazar, Mexico.

Very similar to *politum* but stouter. Elytra round-oval and foveae mostly present (fig. 37); gonapophyses in fresh examples with a pointed tip, and the inner sides of the sclerites

in the basal part of the genitalia having more distinct depressions than in *politum*.

Length, 15–18 mm.; width, 6–9 mm.

DISTRIBUTION: Has been recorded from only one place—Salazar, Mexico.

As indicated in the preceding discussion, *diminutum* and *politum* are very similar. Bates (1891) describes *politum* as larger and narrower, 16 to 21 mm. long, and if among *diminutum* a narrow example occurs it is usually very small. According to Breuning (1928b) the length is the same (16 to 18 mm.) for both species. However, specimens of *politum* collected in Real de Arriba are also very small (13 to 14 mm.), and among the 39 specimens of *diminutum* and 23 of *politum* that I have examined smaller and larger individuals have been found.

Jeannel (1940) places these as different species because *diminutum* has a slender and less arcuate penis. I have examined 10 males of *diminutum* and have not found one with the penis as slender as given in Jeannel's paper (1940, p. 225, fig. 195). A slight difference in genitalia, in both males and females, is, however, noticeable.

Casey's *laevissimus* is nothing but a synonym of *diminutum*. It was so proved by Breuning (1928b); I have also examined this form.

MATERIAL EXAMINED: Thirty-nine specimens.

***Calosoma (Carabomimus) morelianum* Bates**

Calosoma morelianum BATES, 1891, p. 226.
Type: Huitzilac, Morelos.

This species has the round-oval elytra of *diminutum*, but the elytral striae are deep and punctured, the interstices are convex, at least slightly so, finely wrinkled, and with large, deep, scattered punctures, which are not always numerous. There are also a few scattered punctures on the head. Penis as in *politum*, but the tip is shorter and very broad. Female genitalia as in *striatulum*.

Length, 13–17 mm.; width, 6–7.5 mm.

DISTRIBUTION: This species is not common. It occurs in the southern states of Mexico. Federal District: El Guarda; Morelos: Huitzilac; Veracruz: Jalapa.

Breuning (1928b) places *morelianum* as a subspecies of *striatulum*, as he did also to half a dozen other *Carabomimus* which had

been found in the same state as *striatulum*, or at least close by. Jeannel (1940) thinks that *morelianum* is a subspecies of *diminutum*. It more closely resembles *diminutum* in the form of the body, but the pattern of the elytra is quite different, more as in *cicatricosum*. Bates (1891) considers *morelianum* a variation of *diminutum*. However, he has seen examples of *morelianum* from Jalapa which were intermediate in the form of the body between *diminutum* and *striatulum*. The places where these species occur are adjacent; therefore it is doubtful that they can be subspecies. Some records show that *diminutum* is usually found on the plains, while *morelianum* is found in the mountain regions, at high altitudes.

I have seen only two specimens of *morelianum* from the Federal District.

***Calosoma (Carabomimus) digueti* Lapouge**

Figures 145, 197

Eutelodontum depressicollis digueti LAPOUGE, 1924, p. 39. Type: Huejotitan, Jalisco.

DESCRIPTION: Black, often shining; head smooth, without punctuation; labrum slightly curved at margin; mandibles strongly strigose towards base, otherwise smooth; antennae long, reaching beyond humeri; third segment strongly compressed, second segment and base of fourth less so.

Pronotum with sides moderately arcuate; in the widest part, in the middle, about one and one-half times as wide as long; lateral margin narrow; hind angles rounded and slightly extending beyond the basal line, dimples near them either small and shallow, or absent; disk absolutely smooth.

Elytra oval, rather convex, smooth; striae very finely punctured, almost obsolete; interstices flat, foveae absent.

Ventral side more shining, absolutely smooth; sides of abdomen in some specimens slightly wrinkled; penis arcuate, with an elevation near the end, as in *flohri*, tip rather short, broadly rounded, inner armature long and thread-like (fig. 145); female genitalia with distinct depressions on inner sclerites of basal part of genitalia which is perfectly smooth, with only a few punctures bearing short hair; leaf-like process also sparsely, finely punctate at its base, with pointed tip

and long furrow near it bearing tiny setae (fig. 197); punctures of gonapophyses finer than in *striatulum*, *politum*, *diminutum*, and other *Carabomimus*.

Length, 20–25 mm.; width, 6–9 mm.

DISTRIBUTION: Southwestern and central states of Mexico. Jalisco: Huejotitan, Tapatitlan; Zacatecas: Laguna Balderama near Fresnillo.

This species was described by Lapouge (1924) as a subspecies of *depressicolle*. Breuning (1928b) considered it to be a subspecies of *blaptoides*, but Jeannel (1940) who studied the genitalia, proved it to be a different species and put it in the subgenus *Carabomimus*, while *blaptoides* is in the subgenus *Calopachys*. I have not seen the type, but I agree with Jeannel that it is a subspecies of neither *depressicolle* nor *blaptoides*. It recalls *Blaptosoma laeve*, but is easily distinguished from the latter by the absence of an apical marginal bead on the pronotum, by the longer antennae, by the genitalia, and other minor characters. As for *depressicolle* and *blaptoides*, they are quite different from *digueti*.

MATERIAL EXAMINED: Fifteen specimens.

***Calosoma (Carabomimus) costipenne* Chaudoir**

Figure 144

Calosoma costipenne CHAUDOIR, 1869a, p. 375. Type: "Mexico."

DESCRIPTION: Like *diminutum* in form, in some specimens with more elongated elytra. Head smooth or very finely wrinkled; labrum with slightly curved margin; mandibles finely strigose.

Pronotum about one and a half times as wide as long, sides feebly, evenly arcuate, lateral margin narrow; hind angles extending a little beyond truncate basal line and moderately broadly or more narrowly rounded; disk smooth or slightly wrinkled.

Elytra round oval or more elongated; each elytron with seven convex ribs, furrows between them with a wrinkled surface and traces of striae on each side of the furrow, near the ribs. This type of elytra is as in *viridisulcatum*; some specimens have small foveae on the second and third ribs. In some specimens the elytral ribs are hardly convex and very indistinct, but the striae in shallow furrows are clearly visible.

Ventral side smooth, brownish, sides of abdomen punctate and wrinkled. Penis arcuate, with a more rounded tip than in *striatulum* (fig. 144), more nearly like that of *cicatricosum* and of *asper*, but with a shorter inner armature than in *asper*. Female genitalia as in *striatulum*, with shallow depressions on inner sides of sclerites of basal part of genitalia; in some forms the depression inconspicuous.

Length, 15–18 mm.; width, 7–8 mm.

DISTRIBUTION: Southern states of Mexico. Guerrero: Hidalgo: El Chico, Pachuca; Mexico: Rio Frio.

According to the original description, the second elytral rib is broken by foveae into a chain, the fourth is broken in the middle only. Jeannel states that the third rib has foveae. Of the specimens that I have examined only three had foveae on the second rib. Apparently this character is not constant in *costipenne*, as it is often not constant in other species.

Breuning (1927), who listed almost all *Carabomimus* as subspecies of *striatulum*, included *costipenne* also, but Jeannel (1940) proved it to be a different species, and I quite agree with him. *Carabomimus costipenne* differs from all other species of the same subgenus in the peculiar pattern of the elytra, although the head, the pronotum, and the ventral side are as in *striatulum*, *striatipenne*, and other closely related species.

MATERIAL EXAMINED: Twelve specimens.

***Calosoma (Carabomimus) cicatricosum* Chaudoir**

Figures 38, 152

Calosoma cicatricosum CHAUDOIR, 1869a, p. 374. Type: "Mexico."

DESCRIPTION: Black, head with fine, moderately close punctation on the front and near the eyes, seldom quite smooth; labrum with a little notch in the middle; mandibles moderately stout, lightly strigose; antennae with third segment and base of fourth rather compressed.

Pronotum as in *striatulum*, flat, smooth or wrinkled on the sides and apex; without impressions near hind angles, which are broadly rounded and hardly extend beyond basal line.

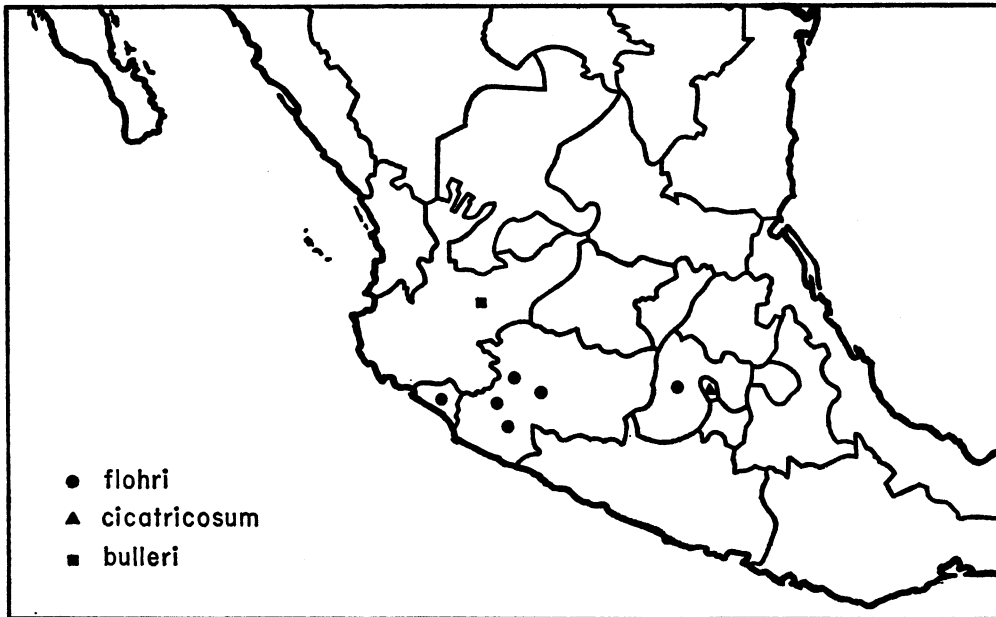


FIG. 8. Distribution of *Calosoma* (*Carabomimus*) *flohri* Bates, *cicatricosum* Chaudoir, and *bulleri* Beheim and Breuning.

Elytra oblong-oval; striae confused, interstices sprinkled with large, irregular punctures, but some examples with smoother elytra.

Ventral side smooth, metaepisternum with sparse, shallow punctures; sides of abdomen and entire first abdominal segment with deeper, denser punctation and wrinkles. Penis wide, with a broad and rounded tip, in some specimens slightly truncate at extreme end (fig. 152), very much as in *costipenne*; female genitalia as in *striatulum*, but depressions on inner sides of the basal sclerites more distinct, though shallow, and tip of leaf-like process more pointed, the setae in the furrow near the tip in some examples almost reaching the end of it.

Length, 17–22 mm.; width, 6–8 mm.

DISTRIBUTION: Mexico: Federal District: Mexico City; Mexico: Altapango near Chalco, Amecameca.

Breuning (1928b) considered *cicatricosum* and *flohri* to be subspecies, and Jeannel (1940) made *cicatricosum* a subspecies of *striatulum*. I think it is more like *striatulum* than *flohri*, but it is easily distinguished from *striatulum* by the punctation on the head and by the sculpture of the elytra; *flohri*, which

also has punctation on the head, has much larger and coarser punctures, and also has a punctate pronotum. All these species are found in the southern part of Mexico, in the same or neighboring states, so that it is very doubtful that they are subspecies.

Calosoma cicatricosum is also like *striatipenne*, which has deep elytral striae, but the striae in *striatipenne* are more regular and there are no scattered punctures to make the pattern confused.

I have seen 10 examples of *cicatricosum* and among them two with rather smooth elytral sculpture, and one without punctation on the head, yet they are different from *striatulum*, *striatipenne*, and the rest of the *Carabomimus* species.

Calosoma (*Carabomimus*) *flohri* Bates

Figures 40, 146, 150

Calosoma flohri BATES, 1884 (1881–1884), p. 262. Type: Uruapan, Michoacan.

Calosoma (*Blaptosoma*) *lesnei* BREUNING, 1931, p. 620. Type: Toluca, Mexico.

DESCRIPTION: Black, oblong-oval; head smooth, with a few punctures at the front, near eyes, and in some specimens on clypeus. In others the head is rather densely punctate;

in still others it has punctures only near the eyes, which are projecting. Labrum slightly curved at margin; mandibles lightly strigose; antennae extending beyond humeri and are as in *depressicolle*.

Pronotum narrowed behind, sides arcuate at the front, straighter posteriorly, the widest part before the middle; hind angles small, narrowly rounded, slightly projecting beyond the truncate basal line; lateral margin narrow, apex with incomplete marginal bead; disk smooth, with sparse punctures throughout, but denser at the base, some specimens having a dense punctation on the disk. The punctation on the pronotum is a character by which *flohri* is easily identified.

Elytra oblong-oval, with slightly confused striae, interstices slightly convex or flat, with irregular, scattered punctures, among which the usual rows of foveae are inconspicuous.

Ventral side dark brown, smooth, sides of abdomen punctured and slightly wrinkled. Penis with an elevation near the end, on the inner side (fig. 146); gonapophyses slender, smooth, with a few minute punctures; the basal sclerites longer than in *striatulum*, *politum*, and the rest of this (*striatulum*) group, the depressions on the inner sides of sclerites distinct and often deep; tip of leaf-like process pointed, at least in fresh examples; elongated furrow near tip bearing two tiny, inconspicuous setae.

Length, 18–21 mm.; width, 6–7.5 mm.

DISTRIBUTION: Southwestern states of Mexico. Colima; Mexico: near Toluca; Michoacan: near Corupo, Tancitaro, Taretzuruan near Paracho, Uruapan, San Juan Tumbio.

Bates [1884 (1881–1884)] described *flohri* as a distinct species. Breuning (1928b) placed it as a subspecies of *cicatricosum*, an action which Blackwelder (1944) followed. Jeannel (1940), on the other hand, considered it to be a subspecies of *depressicolle*. It is true that *flohri* has much in common with both, because all members of *Carabomimus* with deep striae and scattered punctures on the elytra are very much alike. However, *flohri* differs not only in the punctures on the pronotum or on the head, but also in the form of the penis, which is asymmetrical, with a large elevation near the end. I believe that Bates is correct and that *flohri* is a separate species.

The form *lesnei* Breuning from Sierra de

Thalpajahua, near Toluca, is so close to *flohri* that it is hardly possible to separate them. It seems that *lesnei* is a little smoother, with less punctation on the head and disk of the pronotum. Breuning (1928b) considered it to be a different species. Jeannel (1940), however, placed it as a subspecies of *depressicolle*, as he did *flohri*, and he even considered it possible that *lesnei* was a synonym of *depressicolle*. But *lesnei* is quite different from *depressicolle* and is quite similar to *flohri* in every respect, including the genitalia (fig. 150). Apparently *lesnei* is a synonym of *flohri*.

MATERIAL EXAMINED: Fourteen specimens.

Calosoma (*Carabomimus*) *depressicolle* Chaudoir

Figure 147

Calosoma depressicolle CHAUDOIR, 1869a, p. 375.
Type: Toluca, Mexico.

DESCRIPTION: Black, head smooth, without punctation, occasionally with a few fine punctures near eyes and at the front; labrum moderately or slightly curved at margin; mandibles mostly stout, smooth or finely strigose and punctate; antennae long, reaching beyond the humeri, in some nearly one-half of the length of the body, third antennal segment moderately compressed at the base, in some specimens almost cylindrical, second segment and base of the fourth hardly compressed.

Pronotum narrowed posteriorly, more than one and a half times as wide as long in its widest place anterior to the middle; sides arcuate at the front part and straighter behind; hind angles narrowly rounded and extending beyond the basal line; lateral margin thin, hardly wider at the base; some specimens having traces of marginal bead on the apex of pronotum, others with none; disk smooth or with extremely fine punctures near hind angles.

Elytra with regular striae, flat or slightly convex interstices, and with distinct rows of large foveae, without or with a few additional dimples on sides of elytra.

Ventral side dark brown, smooth, sides of abdomen often with deep, sparse punctures. Penis arcuate, tip broadly rounded (fig. 147); female genitalia with the same shallow de-

pressions on inner sides of sclerites of the basal part of genitalia as in *striatulum*, but the leaf-like process, in some specimens, a little more slender than in *striatulum*, with narrowly rounded or pointed tip.

Length, 17–22 mm.; width, 6–8.5 mm.

DISTRIBUTION: Has been recorded only from Toluca, Mexico.

Similar to *altipeta* and *asper*, but differing from them in the smoother elytra, with large foveae, and in the genitalia. Jeannel (1940) considered that *asper*, *lesnei*, *altipeta*, and *flohri* were subspecies of *depressicolle*, all being found at the same locality or in closely adjacent regions. Therefore it is doubtful that they are subspecies and not full species, except for *lesnei*, which is a synonym of *flohri*.

MATERIAL EXAMINED: Fourteen specimens.

***Calosoma (Carabomimus) altipeta* Jeannel**

Figure 149

Calosoma altipeta JEANNEL, 1940, p. 229. Type: Volcans de Nevada, Toluca, Mexico.

I have not seen this species, but, according to Jeannel, it has the same strong sculpture of the elytra as *asper*, all sprinkled with large punctures; the pronotum, however, has more

projecting hind angles, and the penis is strongly narrowed towards the end, with a pointed tip (fig. 149).

Recorded only from Volcano de Nevada, Toluca, Mexico.

***Calosoma (Carabomimus) asper* Jeannel**

Figures 39, 86, 148

Carabomimus depressicolle asper JEANNEL, 1940, p. 229. Type: "Mexico."

Smaller and more slender than *depressicolle* (length, 16–19 mm.; width, 6–7.5 mm.). Elytra with convex interstices and numerous scattered punctures and dimples, which in some individuals form a pattern; foveae not always conspicuous. Penis arcuate towards the end, tip broadly rounded (fig. 148); gonapophyses as in *flohri*, more slender than in *depressicolle*, with more distinct depressions on inner sides of basal sclerites of genitalia.

From *altipeta*, which is said to have the same strong sculpture of the elytra, *asper* differs in the form of the penis, which is broadly rounded at the end, not pointed as in *altipeta*.

DISTRIBUTION: Occurs in the southern states of Mexico. Federal District: Mexico City; Mexico: Amecameca, Salazar, Vol-

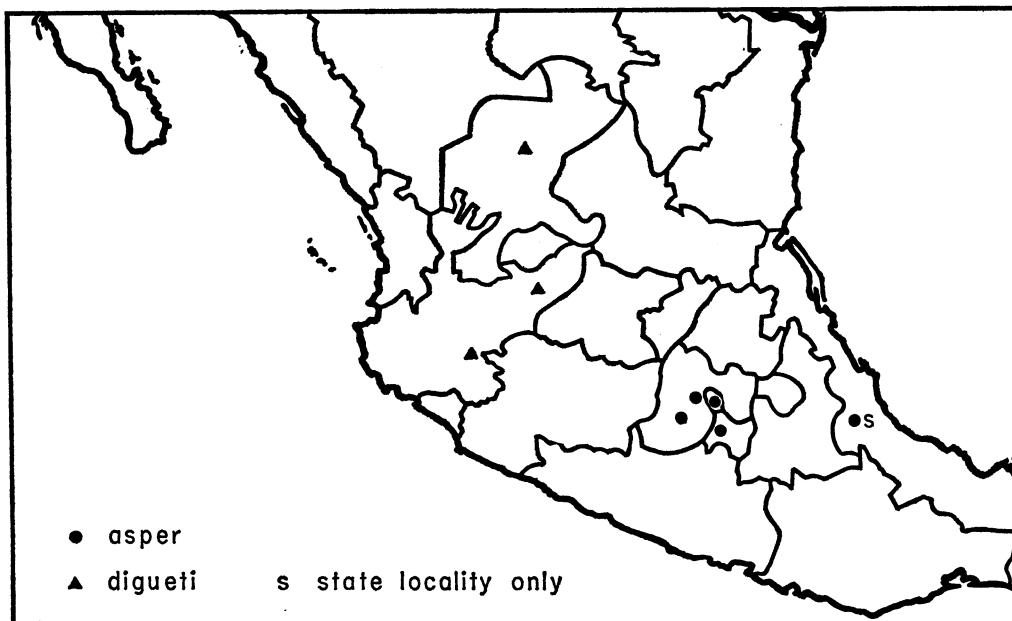


FIG. 9. Distribution of *Calosoma (Carabomimus) asper* Jeannel and *digueti* Lapouge.

cano de Nevada near Toluca; Morelos: Huitzilac; Veracruz.

It seems that *asper* is more common and more widely distributed than *depressicolle*, *altipeta*, or *flohri*, the last-named occurring in the southwest of Mexico, while *asper* is more common in the southeast. *Depressicolle* and *altipeta* have been recorded only from near Toluca.

MATERIAL EXAMINED: Thirty-six specimens.

Calosoma (Carabomimus) bulleri Beheim and Breuning

Calosoma (Blaptosoma) bulleri BEHEIM AND BREUNING, 1943, p. 21, pl. 3, fig. 23. Type: Guadalajara, Jalisco.

According to Beheim and Breuning (1943), this species is similar to *Calosoma (Calopachys) omiltemium*, but it has long hind angles extending beyond the basal line of the pronotum, a character that allies it with the subgenus *Carabomimus*, and for this reason I place it in this subgenus.

I have not seen *bulleri*; therefore I give the original description.

DESCRIPTION (TRANSLATED): "It is close to *omiltemium* Bates, but differs in the following characters: mandibles long, narrow, smooth; head slightly thicker, without punctation; pronotum with the anterior edge more truncate, the sides more strongly heart shaped, hind angles triangular, projecting distinctly beyond the basal line. Elytra slightly flattened, less convex, apical part a little more broadly rounded; sculpture regular, foveae small, few in number. Second and third ribs neither crenate nor broken. Upper side blue-violet, slightly shining, ventral side and legs black, antennae and palpi brown.

"Length, 17–20 mm.; width, 6.75–7.75 mm.

"Type, one female from Jalisco, Guadalajara, Mexico, paratypes, two females from Jalisco and Mascota."

SUBGENUS **CALOPACHYS** HAURY

Calopachys HAURY, 1880, p. 164. Type: *Calopachys viridissimum* Haury.

Eutelodontum GÉHIN, 1881, p. cxxxii. Type: *Calosoma blaptoides* Putzeys.

DESCRIPTION: Black or green, wingless. Head smooth or with large, deep punctures;

mandibles also smooth or lightly strigose; last segment of maxillary palpi as long as the preceding; antennae long, reaching beyond the humeri, in some specimens about one-half of the length of the body; third segment and the base of the fourth compressed, in some individuals only slightly, as in *omiltemium*, antennae uniformly pubescent, beginning with the fifth segment.

Pronotum narrowed posteriorly or cordiform, the widest part anterior to the middle, seldom near the middle, sides arcuate at the front part, straighter posteriorly, lateral margin narrow from apex to base; apex mostly with a distinct marginal bead; hind angles small, pointed, hardly extending beyond the basal line, dimples near them small and inconspicuous; disk smooth or very finely wrinkled, flat or slightly convex.

Elytra oblong-oval, narrow, with strongly rounded humeri, margin near them even; sculpture variable, either striae fine and interstices flat (*blaptoides*), or striae deep and interstices convex with deep punctures (*omiltemium*).

Ventral side smooth, metaepisternum not longer than wide, wings absent; legs slender, metatrochanter with one seta, all tibiae straight in both sexes, anterior tarsi of male with three segments dilated and a dense brush underneath; penis slightly arcuate, uneven, with elevations at the end, inner armature long, thin, with a round or oval "button" on the tip (figs. 153, 154).

The subgenus *Calopachys* was described by Haury (1880) for one species (*viridissimum* Haury). Breuning (1928b) reduced *Calopachys* to a synonym of *Blaptosoma*, but later Jeannel (1940), who considered *Calopachys* to be a genus, united under this genus all *Calosoma* with the same form of the inner armature of the penis.

The subgenus *Calopachys* has only three species: *viridissimum* Haury, *omiltemium* Bates, and *blaptoides* Putzeys. In addition to the peculiar form of the genitalia these species have in common the following external characters: (1) pronotum strongly narrowed posteriorly, with thin lateral margin and small hind angles, hardly projecting beyond the basal line; (2) oblong-oval elytra, with strongly rounded humeri and often pointed apex; (3) smooth ventral side, often without

punctuation, or with a few punctures on the sides, except in *viridissimum*; (4) long, slender legs; and (5) long antennae.

KEY TO THE SPECIES OF THE SUBGENUS
Calopachys HAURY

1. Brilliant bluish green beetles; larger, length, 25 mm.; head and pronotum punctate; elytra with deep striae and convex interstices. Mexico . . . *viridissimum* Haury
Black beetles; smaller, length, 17–25 mm.; head and pronotum smooth 2
- 2(1). Elytra with deep striae and convex interstices, broken by regular rows of punctures and dimples. Length, 17–21 mm. Guerrero *omitemium* Bates
Elytra with obliterated striae and flat interstices. Length, 19–25 mm. Southern Mexico *blaptoides* Putzeys

***Calosoma (Calopachys) viridissimum* Haury**

Calosoma viridissimus HAURY, 1880, p. 164.
Type: "Mexico."

Since the description of a single female of this species by Haury in 1880, there have been no further specimens collected, as acknowledged by Jeannel (1940) and others.

Haury described it as a Mexican species, because it was assumed that all *Calosoma* in Oberthür's collection were from Mexico. Géhin (1885) suggested that it might also occur in the Antilles, but Roeschke, as reported by Breuning (1928b), thought that it was found in Coahuila, Mexico. Jeannel (1940), who saw the type form, placed it in the subgenus *Calopachys*, where I agree that it belongs. I have not seen this single specimen. For that reason I find it advisable to give the original description.

DESCRIPTION (TRANSLATED): "Black, head and thorax on the top and both elytra green; thorax thickly, strongly rugose and punctate.

"Elytra round, very convex as in *Carabus glabrato*. Length, 25 mm.; width, 11 mm.

"Ventral side black, slightly shining, only epipleura and the sides of prosternum greenish black; the episternum of metathorax and sides of abdominal segments, except the last segment, covered by rather numerous, large and deep points, which are sparser on the abdominal segments, towards the elytral margin; the legs moderately large and thick; all tibiae straight and tarsus underneath covered by brownish red hair.

"Labial palpi somewhat of hatchet form (maxillary palpi broken), the mandibles strigose, very large, becoming dull on the tip; a furrow along the exterior margin, very large and deep, disappearing gradually in the middle of the mandibles; labrum deeply emarginate and ciliated at the anterior border; four first segments of antennae brilliant black, the second segment shorter, the third compressed at the exterior border, the other segments pubescent and brown.

"The whole upper side light brilliant green, with a dark blue azure luster. The head, including mandibles, is 6.25 mm. long, 3 mm. wide, covered by deep, large punctures, more closely set towards the sides and the base of the head. Thorax almost flat, 4.5 mm. long, 6.75 mm. wide, narrower towards the base than at the front, with strongly rounded sides, the whole surface covered with punctures, similar to those on the head, and as closely set; the intervals between the punctures with large, confused, elevated creases; the sides with a thin black bead; posterior angles hardly visible; no median line.

"Scutellum green, triangular, the end blunt, with longitudinal furrows. Length of the elytra, 14.5 mm.; width, 11 mm. Elytra of the same color as the head and the pronotum; strongly convex; humeral angles very prominent, by their convexity recalling those of *Carabus glabratus* female, each elytron with longitudinal and very deep striae, smooth and not punctured at the bottom; striae irregularly interrupted by a little arcade or bridge lying on the same level as the intervals; these intervals beginning at the suture without marginal bead; fifteenth interval nearer the border and reaching the umbilical line, formed by granules, not flat at the top and separated from the lateral border only by a few transverse, narrow wrinkles; the lateral margin only slightly lifted; the fourth, eighth, and twelfth intervals interrupted by rows of irregular, impressed punctures."

***Calosoma (Calopachys) omitemium* Bates**

Figures 41, 87, 153, 198

Calosoma omitemium BATES, 1891, p. 226, pl. 13, fig. 1. Type: Omiteme, Guerrero.

DESCRIPTION: Black, usually with greenish luster; head smooth, with fine wrinkles in de-

pression near the eyes and clypeus, and in some specimens with a few punctures; labrum curved at the margin and slightly wrinkled; mandibles slender, strigose only near the edge, in quite a few individuals entirely smooth; antennae long, reaching beyond humeri, only the third antennal segment compressed and not always distinctly so.

Pronotum slightly wider than long in its widest place anterior to the middle, sides arcuate at the front, straighter posteriorly; hind angles pointed or obtuse, hardly extending beyond basal line; disk smooth, median line distinct, often crossed by numerous fine, transverse wrinkles; lateral margin thin, apical marginal bead in most specimens rather distinct, in a few incomplete.

Scutellum much wider than long, wrinkled, in some specimens with a furrow in the middle.

Elytra oblong-oval, narrow, apex pointed; striae deep, regular, not punctured, confused slightly at extreme apex; interstices rather convex, in some individuals the first three apparently a little narrower; second, third, fourth, sixth, eighth, and twelfth interstices broken by rows of dimples, giving the elytra a peculiar pattern (fig. 41); elytral margin bluish green; the three rows of foveae inconspicuous.

Ventral side brownish, smooth or very finely wrinkled, without punctures, or with a few on the metaepisternum; last abdominal segment bearing eight setae on the apex and with no additional rows of setae in the middle of the segment; fourth and fifth segments in most specimens with four, sometimes eight, setae each, instead of the usual two as in the majority of *Calosoma*, which very seldom have more than four setae on each segment. Penis uneven, with elevations and depressions, narrowed and bent at the end and with rounded tip (fig. 153); gonapophyses slender, tip narrowly rounded, the furrow near the tip elongated and bearing two setae which almost reach the tip of the process; basal sclerites slender, convex, in some specimens compressed, but without obvious depressions on the inner sides of sclerites, with a few large punctures bearing short hair (fig. 198).

Length, 17–21 mm.; width, 6–8 mm.

DISTRIBUTION: Seems to be localized in one state, Guerrero: Omilteme and Chilpancingo del Bravos.

This is a very distinct species, distinguishable from the others at first glance by the pattern of the elytra, form of the pronotum, and other characters. It can hardly be mis-

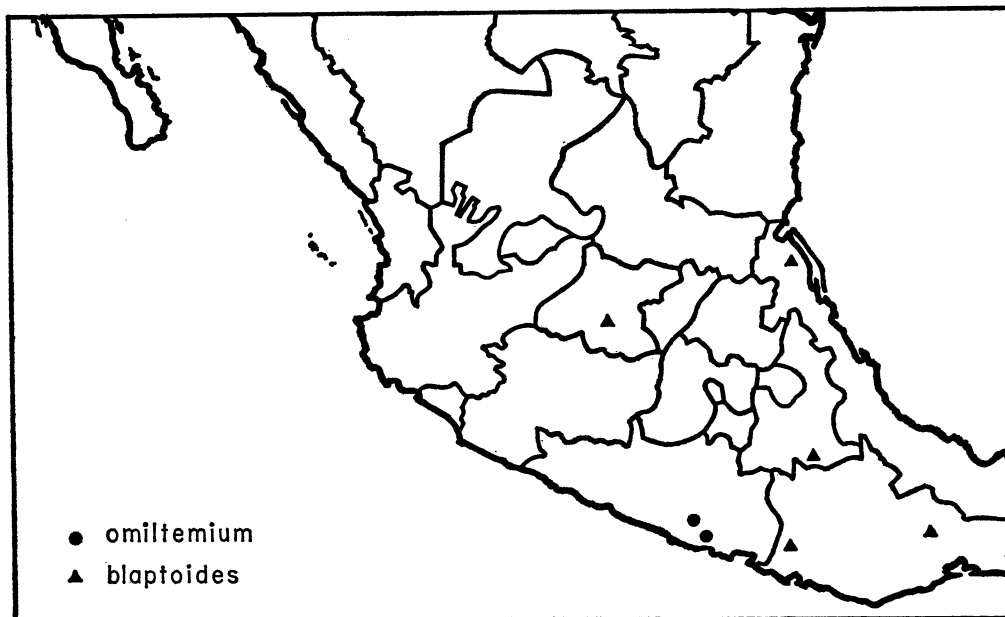


FIG. 10. Distribution of *Calosoma (Calopachys) omiltemium* Bates and *blaptoides* Putzeys.

taken for any other species of the same subgenus or of other subgenera.

MATERIAL EXAMINED: Ninety specimens.

***Calosoma (Calopachys) blaptoides* Putzeys**

Figure 154

Calosoma blaptoides PUTZEYS, 1845, p. 400.
Type: "Mexico."

Eutelodontum depressicolle tehuacanum LAPOUGE, 1924, p. 40. Type: Tehuacan, Puebla.

DESCRIPTION: Black, dull, with elongated body. Head smooth, finely wrinkled, or in some specimens (variation *tehuacanum*) sparsely punctate at the front and near eyes; mandibles long, smooth or lightly strigose; labrum with a curved margin; antennae long, reaching beyond the humeri, only the third segment distinctly compressed.

Pronotum cordiform, narrowed posteriorly, hind angles small, pointed, hardly extending beyond basal line, basal dimples inconspicuous; disk smooth or finely wrinkled.

Scutellum wider than long, wrinkled. Elytra rather long and narrow, with almost parallel sides, as in *protractum*, only slightly wider; striae obliterated, in some specimens three rows of foveae present.

Ventral side smooth, sides of abdomen punctate; penis very much as in *omiltemium*, but the tip of the inner armature more rounded (fig. 154).

Length, 19–25 mm.; width, 6.5–8.5 mm.

DISTRIBUTION: This species is not common. It occurs in the southern part of Mexico. Guanajuato: Pueblo Nuevo; Oaxaca: Capulpan, Zempoaltepec; Puebla: Tehuacan; Veracruz: Cerro de Plumas.

Lapouge's *tehuacanum*, which was described by him as a subspecies of *depressicolle*, was proved by Jeannel (1940) to have nothing in common with *depressicolle*, which is even in a different subgenus (*Carrabomimus*). Actually *tehuacanum* is a variation of *blaptoides* and was placed by Jeannel as a synonym of the latter. *Blaptoides* is similar to *omiltemium*, but absolutely smooth and therefore easily distinguished. It is also larger than *omiltemium*.

I have not seen the type form, and in all the material that I have examined I found only two specimens of *blaptoides*.

GENUS *CALLISTHENES* FISCHER

Callisthenes FISCHER, 1822¹ (1820–1822), p. 84.
Type: *Callisthenes Panderi* Fischer.

The beetles of the genus *Callisthenes* differ from the species of the genus *Calosoma* in the short antennae, with distinct, elongated, glabrous spots on the fifth and following segments, in the round oval elytra with rounded humeri, and in the absence of wings. These characters are also to be found in *Calosoma*. Some species of the genus *Calosoma*, mostly of the subgenus *Chrysostigma*, have glabrous spots on the antennal segments, and the species of the subgenera *Blaptosoma*, *Carabomimus*, and *Calopachys* are wingless and have rounded humeri, but the wingless *Calosoma* have uniformly pubescent antennae, except in *haydeni*, and the glabrous spots of the antennae in *Calosoma* are very seldom as distinct as in *Callisthenes*.

This genus was first described by Fischer [1822 (1820–1822), type *Panderi* Fischer]. Later it was recognized by other authors, as Ménétériés (1843), Lacordaire (1854), Géhin (1885), Kolbe (1895), Casey (1897), and Bradley (1930). Van Dyke (1943) believes that the American *Callisthenes* (all in the subgenus *Microcallisthenes*) originated as offshoots from certain American *Calosoma*, and are entirely separate from the Old World *Callisthenes*.

Jeannel (1940) separated the American *Callisthenes* from the Asian and European forms and united them with the species from the Balkans, described by Apfelbeck (1918) under the genus *Microcallisthenes*. I think that *Microcallisthenes* is more like the genus *Callisthenes* and that it is a subgenus of it.

Jeannel (1940) divided the *Callisthenes* group, or "série," into four genera: *Chrysostigma* Kirby, *Microcallisthenes* Apfelbeck, *Callisthenes* Fischer, and *Teratexis* Semenov and Znojko. Of these, only the first two are to be found in America. *Chrysostigma* is a

¹ Although the volume is dated 1820–1822 on the title page, it has usually been cited as 1822, probably because of the dedication letter by Fischer dated May 18, 1822; actual publication could not have been before that date.

In the literature and in Csiki (1927) an earlier reference to the genus is given as "1821, Lettre à Pander . . .," a rare publication not available to me. It is not referred to in any way in the 1822 paper, in which the genus is fully described.

subgenus of *Calosoma* and does not quite fit in the group of *Callisthenes*, because the main character of the latter (glabrous spots on the antennae) is not constant in *Chrysostigma*. Many species, or even individuals, have uniformly pubescent antennae, beginning with the fifth segment, and if the glabrous spots in *Chrysostigma* are present, they are not so distinct as in *Callisthenes*. In addition, the species of *Calosoma* of the subgenera *Camegonia* and *Camedula*, which are not included by Jeannel in the group, may also have indistinct glabrous spots on the antennae.

According to Jeannel, *Microcallisthenes* differs from the subgenus *Callisthenes* by having a normal labium with setae, and not a short one as in *Callisthenes*, and in the first segment of the hind tarsi which is not flattened in *Microcallisthenes*.

SUBGENUS MICROCALLISTHENES APFELBECK

Microcallisthenes APFELBECK, 1918, p. 161. Type: *Microcallisthenes pentheri* Apfelbeck.

Isostenia LAPOUGE, 1929, p. 2. Type: *Calosoma wilkesi* LeConte.

Callistenia LAPOUGE, 1929, p. 2. Type: *Calosoma moniliatus* LeConte.

The subgenus *Microcallisthenes* is found in North America and the Balkans. It was first described by Apfelbeck for the Balkan forms, which are similar to the American ones.

The two subgenera of Lapouge (*Callistenia* and *Isostenia*), as was proved by Jeannel (1940), are of little value as subgenera.

DESCRIPTION: Black or dark brown species, except *subaeneus* and *moniliatus*, which are bronze or metallic green. Body short, convex, elytra round-oval or oval, wingless. Head usually wider than one-half of pronotum, only *latipennis* and *dietzi* having a comparatively small head; usually whole head densely punctate and wrinkled, in some specimens only at the front; eyes slightly projecting and having one seta near each, except some species of the *luxatus* group which have from two to six setae; tooth of mentum mostly long and pointed, with or without pore punctures; last segment of maxillary palpi shorter and wider than the preceding; antennae short, hardly reaching the humeri, first three segments strongly compressed, especially the third segment, the fourth compressed at the basal part, and all three with

a rather sharp edge; fifth and following segments with elongated, glabrous spots on the outer and inner part, dividing the pubescent area, these spots becoming thinner towards the end of the antennae, or even disappearing completely; in some specimens fifth segment glabrous or punctate on the outer part and with a very small pubescent spot on the inner part, in others sixth segment also almost glabrous; in some individuals glabrous spots not so distinct.

Scutellum triangular, of various sizes, but never so wide as in *Calosoma* (*Carabomimus*). Pronotum very often much wider than long, with sides evenly arcuate or straighter posteriorly; hind angles mostly narrowly rounded, except in *latipennis*, and extending far beyond the straight basal line; in all species except a few in the *luxatus* group, pronotum bearing only one seta, close to the middle of the lateral margin; apex with a distinct marginal bead; disk mostly punctate and wrinkled, often granulated at the base, seldom smooth.

Elytra round-oval, with rounded humeri and even margin near them, except in *luxatus* var. *diffractus* and some individuals of *latipennis* which have a serrated margin; elytral sculpture presenting great variation from being almost smooth, as in *latipennis*, to being scaly and granulated; striae mostly regular or slightly confused, but *moniliatus* and *wilkesi* with confused striae; in *discors* the striae doubled by rows of punctures; in *shaefferi* the number of striae 22 to 24, instead of the usual 16.

Ventral side dark brown or black; mesoepisternum and metaepisternum punctate and wrinkled; proepisternum smooth, punctate, or slightly granulated; metaepisternum not longer than wide, almost square, as always in wingless beetles; sides of abdomen, or rarely the whole abdomen, punctate; last abdominal segment bearing from eight to 12, or, as in *discors*, up to 26 setae on the apex, and, with a few exceptions, with two, four, or six setae in the second row, closer to middle of segment. Fourth and fifth segments with two, four, or six setae each, and third segment invariably with numerous setae. Legs normal, not very slender; meta-trochanter with one seta; middle and hind tibiae straight in both sexes; anterior tarsi of

male with three segments dilated and a brush underneath, but some forms of *luxatus* and *lariversi*, and one Asian species of the subgenus *Callisthenes* with two segments with a brush underneath, some individuals having completely glabrous segments, as in the females. Penis narrowed towards the end, tip rounded, and inner armature with a hook at the end (figs. 155–172). Female genitalia not showing much variation, the leaf-like process having a pointed or narrowly rounded tip, with an elongated furrow near it, and two tiny setae at the upper end of the furrow, the base of the process punctate and with short hair, and the dorsal side strigose; basal part of genitalia mostly sparsely punctate on the inner sides of sclerites, all punctures with short hair (figs. 199–201).

The subgenus *Microcallisthenes* is easily distinguishable from the subgenera of the genus *Calosoma* by the following characters: (1) distinct, elongated, glabrous spots on the fifth, sixth, and other segments of the antennae; (2) almost square metaepisternum; (3) absence of wings; (4) rather rounded, not serrated, humeral angles; (5) oval or round-oval elytra; and (6) straight middle and hind tibiae. The subgenera of *Calosoma* may have one, two, or even three of these characters, but not all of them together, as in *Microcallisthenes*.

In the United States and Canada there are 16 species of this subgenus: *subaeneus* Chaudoir, *moniliatus* LeConte, *wilkesi* LeConte, *latipennis* Horn, *dietzi* Schaeffer, *discors* LeConte, *schaefferi* Breuning, *placerus*, new species, *luxatus* Say, *lariversi* Van Dyke, *monticola* Casey, *subasperatus* Schaeffer, *pimilioides* Walker, *striatius* Hatch, *oregonus*, new species, and *zimmermanni* LeConte.

All these species occur in the western part of the United States and southwestern Canada and are not found in the east or in Mexico.

KEY TO THE SPECIES OF THE SUBGENUS *Microcallisthenes* APFELBECK¹

1. Elytra with large foveae, as wide as interstices, often with chain-like elevations between them, striae confused or more regular; bronze, green, or dark beetles. 2

¹ Hatch's *striatius* (not examined) does not appear in the key.

- Elytral foveae small or absent, striae more regular and distinct, interstices without chain-like elevations; black or brownish black beetles 4
- 2(1). Elytral striae more regular, or slightly confused, interstices with deep, transverse wrinkles, but without chain-like elevations; bronze, greenish, or black, with golden luster. Length, 17–20 mm. Western part of the United States and Canada *subaeneus* Chaudoir
Elytral striae confused, interstices scaly or granulated, rather rough, with chain-like elevations often present 3
 - 3(2). Elytra bronze or metallic green, with three distinct rows of regular, chain-like elevations on each elytron. Length, 14–19 mm. Western part of the United States and Canada
. *moniliatus* LeConte
Dark brown or black beetles, with coppery or darker elytral foveae and without, or with less distinct and irregular, elevations. Length, 15–20 mm. Western part of the United States and Canada. . .
. *wilkesi* LeConte
 - 4(1). Elytral interstices with rows of punctures or with double striae, in some specimens very faint; striae distinct and regular or confused 5
Elytral interstices without rows of punctures or double striae; striae distinct or obliterated 8
 - 5(4). Elytra granulated, with confused punctures and deep wrinkles or creases. Length, 13–18 mm. California
. *placerus*, new species
Elytra with distinct, regular striae . . . 6
 - 6(5). Elytra with 22–24 striae, convex interstices, and elongated tegulae; foveae small, but clearly visible. Length, 13–19 mm. California. . . *schaefferi* Breuning
Elytra with 16 striae, interstices flat or slightly convex on sides, and with rows of punctures, in some specimens very faint 7
 - 7(6). Larger beetles, usually 17–23 mm., pronotum wider, with evenly arcuate sides, coarsely punctate, as is the head; elytral striae and interstices with deep punctures. California, Washington, western Canada . . . *discors* LeConte
Smaller beetles, 15–18 mm., pronotum, as well as head, narrowed posteriorly and with finer punctation; elytral striae more finely punctured; punctures on interstices very faint, visible only towards base. California

- 8(4). *dietzi* Schaeffer
Elytra with shallow and obliterated striae
and flat interstices, smooth or with
faint wrinkles 9
Elytra with deep striae, interstices con-
vex, at least towards the sides, with
deep transverse creases forming tegulae
. 10
9(8). Hind angles of pronotum broadly rounded,
extending very little beyond basal line.
Length, 14–18 mm. California, Nevada
. *latipennis* Horn
Hind angles of pronotum narrowly
rounded, extending decidedly beyond
basal line. Length, 13–15 mm. Nevada
. *lariversi* Van Dyke
10(8). Pronotum with several setae at the front
part of lateral margin, with one seta,
two setae, or more in the middle, and
one to four near hind angles 11
Pronotum without setae at the front part
of lateral margin, but with one to
two, seldom three, setae in the middle
part, and with or without setae near
hind angles 13
11(10). Two to four or more setae near each eye;
elytra either with elongated, often flat
tegulae, or with convex tegulae; femur
with longer setae. Length, 15–17 mm.
Western United States and southwest-
ern Canada *monticola* Casey
Only one seta, rarely two setae, near each
eye; femur with shorter setae . . . 12
12(11). Elytral interstices flat on the disk, convex
only towards sides and apex; striae
with minute punctures. Length, 13–15
mm. California, Oregon
. *subasperatus* Schaeffer
Elytral interstices convex, striae without
punctures. Length, 15–19 mm. Western
part of the United States
. *pimelioides* Walker
13(10). Smaller and more slender beetles, usually
less than 18 mm. long. Penis with long
inner armature and elongated tip,
rounded on extreme apex (fig. 172); an-
terior tarsi of male with a thick brush
underneath all three segments. Western
United States, mostly in California . .
. *zimmermanni* LeConte
Larger or stouter beetles. Penis with much
shorter inner armature (figs. 166–168,
171); anterior tarsi of male often with
incomplete brush underneath first seg-
ment, occasionally first segment gla-
brous 14
14(13). Pronotum narrowed posteriorly; anterior
tarsi of male fully covered, with a brush

underneath; elytral tegulae more con-
vex; penis with a small, button-like tip
(fig. 711). Length, usually about 20
mm. Oregon . . . *oregonus*, new species
Pronotum hardly narrowed posteriorly,
twice or more than twice as wide as
long. If pronotum is narrowed posterior-
ly, then anterior tarsi of male not fully
covered with a brush underneath, the
first segment often being glabrous;
elytral tegulae often flat on the disk;
penis with elongated tip, rounded on
the apex (figs. 166–168); elytral tegulae
more rounded. Length, 15–22 mm.
Western part of the United States and
southwestern Canada . . . *luxatus* Say

Callisthenes (Microcallisthenes) subaeneus
Chaudoir

Figures 42, 155

Calosoma subaeneum CHAUDOIR, 1869b, p. 28.
Type: California.

DESCRIPTION: Greenish bronze or black,
with golden luster; head punctate and
wrinkled, as in *moniliatus*, clypeus with finer
punctations; labrum with a little notch in the
middle and very finely punctured or wrin-
kled; mandibles stout, rugose, and punctate;
antennae, as usual in *Microcallisthenes*, short,
with third segment and base of fourth
strongly compressed, and with elongated,
glabrous spots on fifth and sixth segments,
but often these spots not distinctly divided
from pubescent area.

Pronotum twice as wide as long, with sides
almost evenly arcuate, scarcely narrowed
posteriorly; lateral marginal bead distinct at
the front part, as in *discors*, towards base lat-
eral margin slightly lifted; hind angles
broadly rounded and extending a little be-
yond basal line; dimples near them not large,
but clearly visible; disk smoother than in
discors, base and sides rugose and punctate,
disk wrinkled with a few fine punctures; only
one seta in middle of lateral margin.

Scutellum wider than long, as in *wilkesi*.
Elytra oval; striae not always regular, in
some specimens slightly confused, punctate,
lines connecting the punctures inconspicu-
ous; interstices flat, with transverse wrinkles
or creases, but not scaly (fig. 42); foveae
large, present on fourth, eighth, and twelfth

interstices, golden or metallic green, and containing a small granule.

Ventral side brown, with metallic luster; proepisternum mostly smooth, mesoepisternum very finely punctate, metaepisternum, first and second abdominal segments and a large part of the third punctate and wrinkled, the following segments with finer punctation; all bearing setae, eight on the last segment, two to four on the fourth and fifth segments. Penis narrowed towards the end, with a broadly rounded tip (fig. 155); gonapophyses more or less stout, as in *luxatus* from Utah, the dorsal side very finely strigose.

Length, 17–20 mm.; width, 8–10 mm.

DISTRIBUTION: Western United States and southwestern Canada. California, Idaho, Washington. British Columbia.

This species differs from other species of the subgenus *Microcallisthenes* in the peculiar pattern of the elytra. It is not so similar to *latipennis*, which was placed by Breuning (1927) as a subspecies of it, because *latipennis* has regular, fine, and often obliterated striae on the elytra, small foveae, and a penis with a much longer and narrower tip. It is also not a subspecies of *discors*, as suggested by Jeannel (1940), both forms being distinguishable at a glance and occurring in the same localities. *Microcallisthenes subaeneus* is not so common as the other two species.

MATERIAL EXAMINED: Ten specimens.

Callisthenes (Microcallisthenes) moniliatus
LeConte

Figures 43, 156

Calosoma moniliatum LECONTE, 1851, p. 200. Type: Oregon.

Calosoma laqueatum LECONTE, 1860, p. 318. Type: Saskatchewan.

Carabus bicolor WALKER, 1866, p. 313. Type: Vancouver Island.

Callisthenes concinnus CASEY, 1913, p. 66. Type: Idaho.

Carabus taedatus var. *vancouvericus* CSIKI, 1927, p. 286. Type locality not designated.

DESCRIPTION: Upper side bronze or metallic green, ventral side dark brown or slightly bronze. Head black or dark brown, with distinct bronze luster; mandibles stout, smooth or strigose at the base; labrum with a slightly curved margin, wrinkled.

Pronotum nearly twice or a little less than

twice as wide as long, with the widest place anterior to the middle; sides rounded in the anterior part and straighter posteriorly; hind angles narrowly rounded, extending far beyond the basal line; one seta, or two or three setae, in the middle of the lateral margin; disk densely punctate and wrinkled, with confluent punctures at base.

Elytra with three rows of foveae and chain-like elevations between them; no traces of striae, longitudinal and transverse wrinkles making elytra granulated; humeral angles rounded, margin near them even.

Ventral side rough, proepisternum almost granulated, mesoepisternum, metaepisternum, and sides of abdomen punctate and wrinkled; last abdominal segment with eight setae on apex and four additional ones closer to middle of segment; fourth and fifth segments with from four to six setae each. Penis narrowed towards the end, with a broadly rounded tip (fig. 156); female genitalia as in *subaeneus*, but the leaf-like process longer, with a pointed tip, and more deeply strigose on the dorsal side.

Length, 14–18 mm.; width, 7–9 mm.

DISTRIBUTION: Rather common in the western states. Arizona, California, northern part of Idaho, Nebraska, Montana, Oregon, and Washington. Canada: Alberta, British Columbia, Saskatchewan; Vancouver Island.

Calosoma laqueatum LeConte was reduced by LeConte (1862) himself to a synonym of *moniliatus*. *Carabus bicolor* Walker and *Carabus taedatus* var. *vancouvericus* Csiki, according to Breuning (1928b) and Jeannel (1940), are also synonyms. The form *concinnus* Casey from Priest's Lake, Idaho, which was sent to him under the name of *moniliatus*, differs, according to Casey, in being of smaller size (less than 16.5 mm., the length given by Casey for *moniliatus*) and having sparser punctures on the head and pronotum and brighter color of the elytra. Breuning (1928b), who also possessed a specimen, thought it was a local race. I have seen series of *moniliatus* of different sizes, the smallest being 14 mm.; the punctation on the head and pronotum may also be sparser or denser, and the brightness of the elytra depends on the freshness of the beetles. These characters are, I believe, insufficient for the

naming of a new species or even a local race. I have examined Casey's type, and it is not very different from the usual *moniliatus*. Therefore I agree with Jeannel (1940) and Hatch (1953) in considering *concinus* a synonym of *moniliatus*.

Although similar to *wilkesi* and *subaeneus*, *moniliatus* is so easily distinguished from them by the regular elevations on the elytra and by the bright color, that it is unlikely to be confused with these or other species.

MATERIAL EXAMINED: Fifty specimens.

Callisthenes (Microcallisthenes) wilkesi LeConte

Figures 44, 157

Calosoma wilkesi LECONTE, 1851, p. 200. Type: Oregon.

DESCRIPTION: Black or brownish black, some individuals with bronze elytra; head finely, densely punctate throughout, including clypeus; mandibles lightly strigose, in some examples with minute punctures; labrum moderately curved at the margin and often wrinkled; maxillary palpi with the last segment of the same length, but mostly wider than the preceding.

Pronotum about one and one-half times as wide as long, the widest part anterior to the middle, slightly narrowed posteriorly, with obtuse hind angles, extending backward; lateral margin narrow and with one seta in the middle; disk densely punctate throughout, at the base rugose.

Elytra oval, striae confused; interstices granulated or rugose; foveae large, dark, coppery or golden, in some specimens with more or less distinct elevations between foveae, on the fourth, eighth, and twelfth interstices.

Ventral side black or brown, proepisternum and mesoepisternum lightly granulated or with deep, but not large, punctures; metaepisternum, as well as a large part of sides of abdomen, wrinkled and punctate; last abdominal segment punctate and wrinkled, and bearing from six to eight setae on the apex, and four additional ones closer to middle of segment; fourth and fifth segments with four or six setae each. Penis wide, bent at the end, with a broadly rounded tip (fig. 157); gonapophyses as in *moniliatus*, but stouter, the basal sclerites more convex.

Length, 15–20 mm.; width, 7–11 mm.

DISTRIBUTION: Western and northwestern parts of the United States and southern Canada. California, Idaho, Oregon, Washington. British Columbia.

Breuning (1928b), who did not see this species, supposed that *wilkesi* was close to *moniliatus*, or that it might be an aberration of *luxatus*. Actually, it is a different species, as was established by Jeannel (1940). It can be easily distinguished by the pattern of the elytra, by the genitalia, and by the confused elytral striae; *moniliatus*, which also has confused elytral striae, has more distinct and more regular elevations on the elytra, is more slender, and has quite different genitalia in the males. As for *luxatus*, there is no doubt that it has nothing in common with *wilkesi*; *luxatus* is smaller, black, has regular or only slightly confused elytral striae, no foveae, interstices with regular tegulae, and different genitalia.

The type of *wilkesi* has dark foveae and no chain-like elevations on the elytra.

MATERIAL EXAMINED: Twenty-seven specimens.

Callisthenes (Microcallisthenes) latipennis Horn

Figures 48, 158

Calosoma latipenne HORN, 1870, p. 70. Type: South Sierras, California.

Callisthenes arcuata CASEY, 1897, p. 343. Type: Arizona.

Callisthenes tularensis CASEY, 1913, p. 68. Type: Tulare County, California.

Callisthenes opimus CASEY, 1913, p. 69. Type: Kern County, California.

DESCRIPTION: Black, head small, slightly wider than one-half of pronotum, at the front finely wrinkled and finely, sparsely punctured, in some specimens more coarsely punctured; mandibles short, lightly strigose or rugose and punctate; labrum with even or slightly curved margin; antennae short, beginning with the fifth segment, with glabrous spots, dividing the pubescent area, but rather often these spots present only on the fifth and sixth segments, and in some specimens distinct only at the base of the segments. However, many examples have quite distinct spots on each segment, and the fifth one is glabrous and punctate on the outer side.

Pronotum twice as wide as long, with the widest part in the middle, sides evenly arcu-

ate, and only in some examples straighter posteriorly; lateral margin a little wider at the base, rather narrow at the front part, and with one seta, seldom two setae, in the middle; hind angles flattened, broadly rounded, hardly extending beyond the basal line; disk finely wrinkled or smooth, base usually punctate and rugose.

Elytra oval or round-oval, with rounded humeri and even, occasionally slightly serrated margin near them. (Horn's type form has serrations; all other 85 specimens examined have an even, rarely slightly wavy margin.) In fresh specimens elytral margin with green luster, easily lost; striae fine, punctures of striae connected by fine line, often obliterated towards apex; interstices flat, with a few transverse wrinkles at the base; foveae mostly inconspicuous, in some individuals present, but small, visible because of the green luster.

Ventral side black or dark brown, almost smooth, occasionally proepisternum finely wrinkled and with traces of punctures; mesoepisternum, metaepisternum, and sides of abdomen sparsely punctured, abdomen also finely wrinkled; last abdominal segment bearing up to eight setae, and usually with no additional setae in the second row; fourth and fifth segments with from four to six setae each. Penis slender, in some examples thin, with a narrow, bent tip (fig. 158); gonapophyses slender, with a pointed or narrowly rounded tip, furrow near it with two tiny setae, the basal sclerites of genitalia rather convex, with a more or less sharp ridge.

Length, 14–20 mm; width, 6–8.5 mm.

DISTRIBUTION: Apparently localized in California. Fresno County: Huron; Kern County: Arvin, Mojave; Los Angeles County: Los Angeles, Fairmont, Neenach, Palmdale; Sacramento County: Antelope Valley; San Bernardino County: Atolia, Victorville; Tulare County; and probably other localities in the state. According to Burgess and Collins (1917), also in Reno, Nevada.

Breuning (1927) and Jeannel (1940) placed *latipennis* as a subspecies of *subaeneus*, also from California. These two species are quite different. *Callisthenes* (*Microcallisthenes*) *subaeneus* has a stout penis, broadly rounded at the end, large foveae, rather wrinkled elytral interstices, densely punctate head and pro-

notum, and golden or bronze luster on the elytra.

Casey's form *opimus* from Kern County, California, is very much like *latipennis* but is more roughly punctate and wrinkled and has small, shining foveae. I have seen examples like this from the same place as the typical forms of *latipennis*, and I think that *opimus* is a synonym. Breuning (1927) and Jeannel (1940) place *opimus* as a subspecies of *subaeneus*.

Two other forms of Casey's (*arcuata* from Arizona and *tularensis* from Tulare County in California) are also synonyms. The locality given by Casey for *arcuata* is not usual for *latipennis*, but there is no indication in what part of Arizona it was collected, and it may be an error. As for the type of *arcuata*, it is only a rough example of *latipennis*.

The form *tularensis*, which was placed by Breuning (1927) as a synonym of *dietzi*, and by Jeannel (1940) as a synonym of *discors*, is more like *latipennis* than the other two species, and I think it is a synonym of the latter.

MATERIAL EXAMINED: Eighty-five specimens.

***Callisthenes* (*Microcallisthenes*) *dietzi* Schaeffer**

Figures 49, 159

Calosoma dietzi SCHAEFFER, 1904, p. 197. Type: Tulare County, California.

Callisthenes gravidulus CASEY, 1913, p. 68. Type: Sequoia National Park, California.

DESCRIPTION: Black, head small, but wider than one-half of pronotum because pronotum is narrow; finely punctate near eyes and sides of clypeus, wrinkled at the front; labrum with curved margin; mandibles stout, smooth or lightly strigose; antennae with elongated, glabrous spots on fifth, sixth, and seventh segments.

Pronotum slightly narrowed behind, sides arcuate near apex, straighter posteriorly; lateral marginal bead distinct at the front part, but disappearing towards the base, leaving a small, flat elevation, as in *discors*; hind angles narrowly rounded, projecting beyond the basal line; disk smooth or finely wrinkled and punctate, towards the base coarsely punctate and rugose.

Scutellum wide, often wider than long, which is unusual for *Microcallisthenes*, most

of which have a small or moderately large scutellum, not wider than long.

Elytra round-oval, more or less pointed at the apex, only a little wider than pronotum; striae fine, with elongated punctures connected by fine lines; interstices flat, with punctures between striae, often very faint, disappearing towards apex; in some examples interstices also wrinkled; elytral margin even and with a bluish luster.

Ventral side dark brown or black, with faint bluish luster; proepisternum and mesoepisternum mostly smooth; metaepisternum and sides of abdomen punctate and wrinkled. Penis narrowed towards the end, inner armature large at the base (fig. 159).

Length, 15–18 mm.; width, 7–9 mm.

DISTRIBUTION: Has been recorded only from California. Humboldt County: South Fork; Tulare County: Sequoia National Park, Tule River.

I agree with Breuning (1928b) that *dietzi* is most like *discors*, but I do not think it is a subspecies of it. It differs from *discors* in having a small, narrower body, the pronotum narrower posteriorly, with longer and more pointed hind angles, finer punctation on the head and pronotum, much finer elytral striae, and finer punctures on the interstices. Even the individuals from Tulare County, which have very distinct punctures on the elytra, are distinguishable from *discors* by the same characters.

Casey's *gravidulus* from Sequoia National Park, California, is only a variation of *dietzi* with coarsely sculptured pronotum and blue luster at the base of it and on the elytral margin. It was given to Casey by Hopping under the name of *dietzi*, and I believe that Hopping, and later Breuning, were correct in considering *gravidulus* to be a synonym of *dietzi*.

MATERIAL EXAMINED: Fifteen specimens.

Callisthenes (Microcallisthenes) discors LeConte
Figures 47, 161

Calosoma discors LECONTE, 1857, p. 31, pl. 1, fig. 9. Type: Sacramento, California.

Callisthenes discors inversus CASEY, 1913, p. 67. Type: San Francisco, California.

DESCRIPTION: Black, sculpture rough. Head with dense, often confluent punctures; labrum with even or slightly arcuate mar-

gin; mandibles deeply strigose and punctate.

Pronotum nearly twice as wide as long, sides evenly arcuate, flattened and more lifted at the base; lateral margin narrow and distinct only at the front part of pronotum; hind angles produced beyond basal line and narrowly rounded; disk with dense and confluent punctures, almost granulated towards base.

Elytra oval, with distinct, punctured striae and rows of additional punctures in the interstices, the punctures of the striae connected by lines, while those of interstices not so connected, although some examples with these punctures also connected by lines, forming double striae; foveae inconspicuous.

Ventral side, especially mesoepisternum and metaepisternum, punctate and wrinkled; proepisternum slightly punctate or smooth; abdominal segments more roughly punctate and wrinkled on the sides; last abdominal segment with as many as 26 setae on apex, instead of the usual eight, and also four additional setae closer to the middle of the segment; fourth and fifth segments with from six to 26 setae each, and the third segment with more. Penis slightly arcuate, narrowed towards end (fig. 161); gonapophyses stout, as in *calidum*, but some specimens with quite slender gonapophyses.

Length, 13–23 mm.; width, 5.5–10 mm.

DISTRIBUTION: This species is common in California. Calaveras County; Eldorado County: Camino, Pollock Pines; Madera County: Chiquito Basin, Northfork; Sacramento County; San Francisco; Santa Cruz County: Big Tree; Sierra Nevada, and undoubtedly other localities. According to Burgess and Collins (1917), it has been reported from Washington State.

In the original description LeConte (1857) states that *discors* has the antennae uniformly pubescent, without glabrous spots. I have seen quite a number of specimens from different localities, and one of them, the type, has almost entirely pubescent antennae, with indistinct glabrous spot on the fifth segment. All other beetles, six from LeConte's collection, and 160 examples from other places, have the fifth, sixth, and often the following segments with glabrous spots on the outer and inner sides of each segment.

This species is most similar to *dietzi*, from

which it differs in the wider pronotum, with less narrowly rounded hind angles, the very rough sculpture, and usually larger size.

Casey's *inversus*, as proved by Breuning (1928b), is a synonym. The characters given by Casey (wider prothorax in comparison with more oblong elytra, and larger punctures on the elytral striae in comparison with smaller punctures on the intervals) are not sufficiently distinct. Only a few interstices really have the punctures finer than those of the striae; most of the interstices have the punctures larger, as usual in *discors*. Casey's type is also from California.

MATERIAL EXAMINED: One hundred and sixty-seven specimens.

Callisthenes (Microcallisthenes) schaefferi
Breuning

Figures 45, 162

Callisthenes discors schaefferi BREUNING, 1928b, p. 80. Type: Castella, California. New name for *irregulare* Schaeffer, 1915, p. 235; preoccupied by *irregulare* Walker.

DESCRIPTION: Black, often with faint bluish luster on the lateral margin of elytra and base of pronotum. Head coarsely, densely punctate throughout, wrinkled and with confluent punctures at the front; labrum slightly curved at the margin and wrinkled in the middle; mandibles moderately stout, strigose and punctate, in some examples smooth; antennae, beginning with fifth segment, with distinct glabrous spots, in some specimens fifth segment glabrous, the outer part punctate.

Pronotum a little less than twice as wide as long, in some individuals twice as wide as long, the widest place anterior to the middle, posteriorly pronotum narrowed, sides arcuate at the front part and straighter behind; hind angles extending notably beyond the straight basal line; disk densely punctate and wrinkled, at the base rugose.

Elytra with 22–24 striae, which are regular and not punctured; interstices narrow and convex, crossed by transverse wrinkles forming elongated tegulae of unequal length; fourth, eighth, and twelfth interstices smoother and broken into a chain by small, shallow foveae, each of which contains a little granule.

Ventral side brownish, proepisternum

smooth or with only a few punctures, mesoepisternum, metaepisternum, and sides of abdomen sparsely punctate and slightly wrinkled; last abdominal segment rougher and bearing from eight to 16 setae on the apex and from two to six additional setae closer to the middle, in the second row; fourth and fifth segments with from four to 10 setae each; hind legs slender. Penis with a long and thin tip (fig. 162); gonapophyses stouter than in some forms of *discors*, tip of the leaf-like process pointed or narrowly rounded, as in the northern forms of *luxatus*.

Length, 13–18 mm.; width, 6–9 mm.

DISTRIBUTION: Has been recorded only from California. Humboldt County: Saddle Camp area; Santa Cruz County: Big Tree; Shasta County: Castella; Siskiyou County: Dunsmuir; Trinity County: Carrville, Hayfork, Yallo Bally Mountains.

Breuning (1928b) placed *irregulare* as a subspecies of *discors* and also changed its name to *schaefferi*, because the name *irregulare* had been used by Walker. It is hardly possible that *schaefferi* is a subspecies of *discors*; the difference between the two forms is obvious, and both occur in the same county (Santa Cruz). It is true that the head and pronotum of *schaefferi* are as densely punctate as in *discors*, but the pattern of the elytra is different, more as in *zimmermanni* or other species of the *luxatus* group, although *schaefferi* has 22 elytral striae, more elongated tegulae, and distinct, though very small foveae. Jeannel (1940) considered *schaefferi* to be a synonym of *discors*, which of course is an error.

MATERIAL EXAMINED: Forty-two specimens of *schaefferi*, including the type, and more than 100 examples of *discors*, including the type.

Callisthenes (Microcallisthenes) placerus,
new species

Figures 46, 163

DESCRIPTION OF TYPE, MALE: Similar to *schaefferi*, but with different pattern of the elytra and different genitalia.

Black, without bluish luster; form of the body as in *schaefferi*, head and pronotum also as roughly and densely punctate. Elytra granulated, especially on sides and apex, without regular striae, but with series of

punctures in longitudinal, confused rows; interstices crossed by numerous wrinkles and creases, not forming regular tegulae as in *schaefferi*. Ventral side much rougher than in *schaefferi*, proepisternum granulated, mesoepisternum, metaepisternum, and sides of abdomen coarsely punctate and wrinkled on the sides; last abdominal segment bearing eight setae on the apex and two additional ones closer to middle of segment; fourth and fifth segments with two setae each; legs as in *schaefferi*, anterior tarsi with three segments dilated and a dense brush underneath. Penis stouter than in *schaefferi*, with a much shorter, more rounded tip, inner armature shorter and wider at the base (fig. 163).

Length, 18 mm.; width, 7.5 mm.

Female hardly differing from the male; length, 17.5 mm., width, 8 mm.; gonapophyses almost as in *schaefferi*, but the leaf-like process more slender.

Paratypes very similar to the type, the length varying from 13 to 18.5 mm., the width from 6.5 to 8.5 mm. Some examples have a slightly smoother ventral side and more regular striae; the number of setae is usually as many as eight on the apex of the last abdominal segment, and from two to four on the fourth and fifth segments.

TYPE MATERIAL: Holotype male, allotype female, and four paratypes, collected at Forest Hill, Placer County, California. The holotype was found in May, 1898; the allotype, in April of the same year. Seventeen paratypes were collected at Cisco, Placer County, in June, 1911, some at an altitude of 7500 feet; five paratypes, at Big Tree, Santa Cruz County, in August [no year given], at an altitude of 4102 feet; two paratypes, at Lumber Yard, Amador County; one, at Lake Alpine, San Diego County. All specimens are in the Van Dyke collections at the California Academy of Sciences in San Francisco, except for five paratypes which are in the American Museum of Natural History.

In addition to these specimens I have examined several others, scattered in different collections, all but one coming from Placer County, California. This last one was collected in Tolumne County at Tiga Pass, some 75 miles south of Placer County. Apparently this species is localized in California.

MATERIAL EXAMINED: Twenty-nine specimens.

***Callisthenes (Microcallisthenes) luxatus* Say**

Figures 51, 52, 55, 88, 166-168, 199-201

Calosoma luxatum SAY, 1823, p. 149. Type: Arkansas River, Colorado.

Calosoma striatulus LECONTE, 1859, p. 4. Type: Milk River, Montana.

Callisthenes diffractus CASEY, 1913, p. 75. Type: New Mexico.

Callisthenes utensis CASEY, 1920, p. 165. Type: Stockton, Utah.

Callisthenes semotus CASEY, 1920, p. 166. Type: Stockton, Utah.

DESCRIPTION: Black or brownish black, some specimens with bluish luster on sides of pronotum and elytral margin; head with moderately close, fine punctures and wrinkles, almost smooth or more finely punctate on clypeus, some specimens having denser punctations; eyes with one seta, very seldom two setae, near each; mandibles strigose and punctate; labrum wrinkled, with slightly curved margin; antennae short, hardly reaching the humeri, fifth segment often glabrous, and in some specimens punctate on outer part, inner part with a small pubescent spot, occasionally sixth segment also glabrous; following segments with elongated, glabrous spots, dividing the pubescent area.

Pronotum twice or more than twice as wide as long, slightly or more distinctly narrowed posteriorly, with sides arcuate at the front part and straighter behind, and with one or two setae, seldom three setae, on each side, close to the middle of lateral margin; mostly without setae, but in the northern forms with one or two setae, seldom three setae, near the hind angles, at the base of pronotum; hind angles rounded or obtuse, projecting beyond basal line; disk densely punctate and wrinkled, more so at the base.

Elytra round-oval, striae regular or slightly confused; tegulae subquadrate or rounded, flat or hardly convex towards suture line, more prominent on sides and apex; foveae absent.

Ventral side dark brown or black; proepisternum finely granulated or punctate, mesoepisternum, metaepisternum, and sides of abdomen punctate and wrinkled; last abdominal segment in some specimens with two additional setae in a second row, closer to middle of segment, but most specimens with six to eight setae on the apex, and one seta on each side; fourth and fifth segments with two

to four setae each; legs with shorter setae and spines than in *monticola*; in males anterior tarsi often having only two segments, with a brush underneath, or first segment with an incomplete brush, rarely all three segments hardly dilated and glabrous underneath, as in the females. Penis slightly narrowed towards the end, with a broadly rounded tip, in some forms, mostly those from Utah and Idaho, penis very stout; northern forms with a more elongated penis; inner armature more or less bottle-like, with hook at the end, as usual in *Microcallisthenes*, and in many of the subgenera of *Calosoma* (figs. 166–168). The genitalia of the females are less different in specimens from different localities, although there are slight variations. As a rule gonapophyses slender and smooth, with pointed or narrowly rounded tip, the furrow near the tip usually deep, elongated, with two tiny setae, not always present; basal sclerites of genitalia mostly slender, very convex, often with a sharp ridge or with shallow depressions on the inner sides of sclerites which are also sparsely punctate (figs. 200, 201).

This species, collected in different places, varies greatly in size, from 13 to almost 22 mm. However, usually it is 15 to 20 mm. long, and 7 to 9 mm. wide.

DISTRIBUTION: Western United States and southwestern Canada. Arizona: Grand Canyon. California: Eldorado County. Colorado: Arkansas River, Denver, Fort Collins, Glenwood. Idaho: Bannock County: Pocatello. Montana: Gallatin County: Three Forks, Milk River. Nebraska: Brown County: Kashopa; Sioux County: Hat Creek Valley. New Mexico (without records of the counties). Oregon: Baker County; Benton County: Alpine; Grant County; Klamath County: Crater Lake; Lake County: Goose Lake; Polk County: The Dalles; Umatilla County: Blue Mountains, Toll Gate; Wallowa County. Utah: Cache County: Logan Canyon; Tooele County: Stockton; Utah County: Provo, Timpanogos Mountains, Salt Lake, Vineyard; Wasatch County. Washington: Adams County: Ritzville, Lantz, Wallus; Franklyn County: Pasco; Klickitat County: Roosevelt; Walla Walla County: Lowden; Yakima County. Wyoming: Carbon County: Como, Medicine Bow; Laramie County: Pinebluffs. Canada: Alberta: Calgary, Medicine Hat, Tilley, Jen-

ner, Empress, and Hilda. Saskatchewan: Beaver Creek south of Saskatoon, Forget, and Pike Lake. According to Burgess and Collins (1917), also in Nevada and Kansas, and according to Hatch (1953) in British Columbia.

Because of the confusion and differences of opinion concerning the *luxatus* group, one can never be sure that the localities given for *luxatus* by various authors are correct. Therefore I list only the localities from which I have had the opportunity to examine the beetles myself, except for a few localities given to me by Dr. Lindroth. I have not seen *luxatus* from Nevada, where it is replaced by *pimelioides* or *monticola*. It is also very rare in California. I have seen only two examples from Eldorado County, California, while *monticola*, *pimelioides*, and *zimmermanni* are rather abundant.

Individuals of *luxatus* collected in different places differ from one another, especially in the elytral sculpture, the punctuation on the head and pronotum, and the form of the body. It is possible that these different forms are actually different subspecies, but at the present time I consider them local forms. I have seen 240 examples, but not more than five to 15 specimens from one place. A study of the biology of these forms and experimental work must be done before a decision can be reached concerning a group such as this.

The form *striatulus* LeConte (type from Milk River, Montana), of which I have examined 114 specimens, including the type, occurs in Montana, and in Alberta and Saskatchewan, Canada, where it was collected by Dr. Lindroth. It is a northern form of *luxatus* and differs from the forms from Utah, Idaho, Colorado, and Nebraska in having more regular elytral striae, more convex tegulae, and often a rather shining appearance. In most specimens there are basal setae on the pronotum, and, in a few, double setae near the eyes, more dilated anterior tarsi in the males, with complete brush of dense hair underneath all three segments, and longer inner armature of the penis (fig. 167).

The forms from Oregon (28 examples) are very similar to the forms from Montana and Canada, but the body is often more elongated, the pronotum more narrowed posteriorly and mostly without basal setae. Some, especially the small examples, resemble

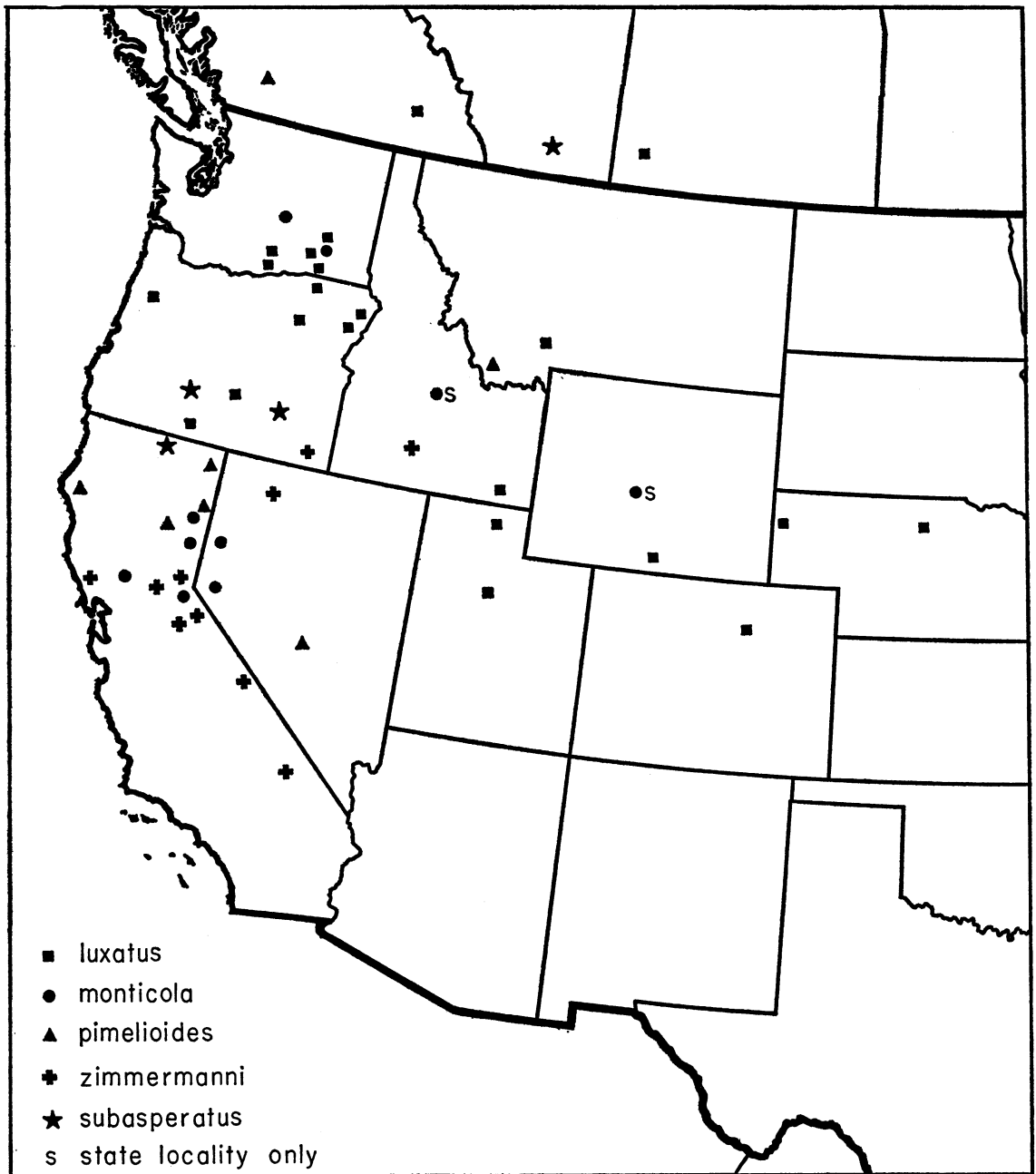


FIG. 11. Distribution of *Callisthenes* (*Microcallisthenes*) *luxatus* Say, *pimelioides* Walker, *monticola* Casey, *zimmermanni* LeConte, and *subasperatus* Schaeffer.

zimmermanni, but they differ in the much shorter inner armature of the penis, and the females are always stouter and larger. The forms from Crater Lake, Oregon, have very confused elytral striae, especially on the sides and apex, and large, round tegulae.

The forms from Washington (23 examples)

have a definitely narrowed posterior pronotum with two, rarely three, setae in the middle of the lateral margin, but without basal setae; rather prominent, though round humeri, convex elytral tegulae, often acute towards the sides and apex; anterior tarsi of males hardly dilated, almost as in the fe-

males, glabrous or with remains of the brush underneath the first segment, or only underneath the second and third segments, the first being glabrous. The penis and gonapophyses are more slender than in the forms from Utah and Idaho, and the tip of the penis is longer (figs. 168, 201). Similar forms, but with basal setae on the base of the pronotum, occur also in Canada.

The forms from Utah and Idaho (44 examples) have slightly confused elytral striae, rather dull appearance, usually one seta in the middle of the lateral margin of the pronotum; the anterior tarsi of the males narrower than in variation *striatulus*, the first segment with an incomplete brush underneath, the second always fully covered, and the third either fully covered by a dense brush underneath or absolutely glabrous; the penis often stout, with broadly rounded tip, and always with a small inner armature (fig. 166). The female genitalia are also stouter than in the northern forms (fig. 199).

The forms from Colorado (18 examples) are mostly rather large, with one seta in the middle of the lateral margin of the pronotum, a stout penis, as in the forms from Utah, and the males with all three segments of the anterior tarsi fully covered by a brush underneath.

The forms from Nebraska (five examples) are large, stout, with very short elytral tegulae formed by deep, transverse wrinkles. Occasionally they have a basal seta on the pronotum.

The forms from Wyoming (12 examples) are usually hardly convex, with more or less flattened elytra, almost flat tegulae, and often with punctures in the striae and in the transverse wrinkles on the interstices. The pronotum is very wide, in some specimens three times as wide as long, and often with basal setae; the anterior tarsi of the males are rather dilated, and all three segments are fully covered by a dense brush underneath; the penis has a smaller and thinner tip than in the other forms of *luxatus*.

Very similar forms, but with more convex elytral tegulae, have been collected in New Mexico (three examples) and in Grand Canyon, Arizona (three examples). However, the forms from Arizona have an incomplete brush on the first segment of the anterior tarsi of the male.

In spite of all these variations *luxatus* is distinguishable from *zimmermanni*, with which it is always compared, by a more rounded and stouter form of the body, by a pronotum less narrowed posteriorly, or at least wider, more flattened elytral tegulae, and much shorter inner armature of the penis. From *pimelioides*, *monticola*, and *subasperatus* it differs in the absence of the front setae on the pronotum and in the genitalia.

The forms making up the *luxatus* group are separable as follows: (1) those with the pronotum with several setae, in most individuals five to eight, at the front part of the side margin, and with one or two setae, in some specimens more, at the base, near the hind angles (*pimelioides*, *monticola*, and *subasperatus*); (2) those with the pronotum with one or two setae, in a few individuals three, in the middle of the lateral margin, and one or two setae, in a few, three, near the hind angles (*luxatus* from Montana, Canada, and Wyoming); (3) those with the pronotum with one or two setae, in a few specimens three, in the middle of the lateral margin and no basal setae (*luxatus*, *zimmermanni*, *diffractus*, *lari-versi*, and *oregonus*).

In addition this group shows variation in the number of setae near the eyes, *monticola* having two setae near each eye, its variation *nevadensis* three to six. Occasionally the northern forms of *luxatus* have also two setae near each eye. However, in a large series of *luxatus* examined, only 12 per cent of the specimens had two setae.

Casey divided the *luxatus* group into many species and subspecies. On the other hand, Breuning (1928b), with whom Hatch (1953) agrees, considered that most were only variations of the same species. Jeannel (1940) placed all as synonyms of *luxatus* and even stated that there is no difference in the morphological characters in this group. It is true that many of Casey's species are only variations of *luxatus* or *zimmermanni*, but there is no doubt that these variations are often striking, and some of Casey's forms are more readily distinguishable than *luxatus* is from *zimmermanni*.

Casey's *utensis* and *semotus*, both from Stockton, Utah, are undoubtedly synonyms of *luxatus*. I have found no difference between these two forms and the typical *luxatus* from Utah.

However, Casey's *diffRACTUS* differs from *luxatus* in the serrated elytral margin, a character quite unusual in *Microcallisthenes*, in the deep transverse wrinkles on the elytra, in finer striae, and in short, uneven tegulae. Breuning (1928b) placed *diffRACTUS* as an aberration of *zimmermanni*, but it is more like *luxatus*, apparently is a variation of the latter, and is therefore a synonym. I have seen only one example of *diffRACTUS* (the type) and have never found anything like it in the *luxatus* group.

MATERIAL EXAMINED: Two hundred and forty specimens.

***Callisthenes (Microcallisthenes) striatius* Hatch**

Callistenia striatius HATCH, 1953, p. 54. Type: Eugene, Oregon.

I have not seen this species, and because of the short description of it I could not place it in the key. The original description is as follows: "Elytra with about ten series of tubercles between the twelfth series (bearing the outermost series of dorsal punctures) and margin; black, pronotum with hind angles feebly lobed, the disk densely, rugosely punctate; the elytral tubercles elongate, moderately developed; 16-17 mm. West Oregon" (Hatch).

Very much like *luxatus*, according to Hatch, differing in narrower elytral tegulae. It is quite possible that *striatius* is merely a variation of *luxatus*.

Callisthenes (Microcallisthenes) lariversi

Van Dyke

Figure 160

Calosoma lariversi VAN DYKE, 1943, p. 17. Type: Lamoille, Nevada.

DESCRIPTION: A remarkable little beetle of the *luxatus* group, but with smooth elytra. Head very finely, moderately densely punctured and wrinkled; labrum with almost even margin; mandibles stout, finely strigose; eyes scarcely projecting, with one seta near each; fifth segment of antennae glabrous, sixth with little pubescent spots, following segments with large glabrous spots and small pubescent area.

Pronotum in its widest part anterior to the middle hardly one and one-half times as wide as long; sides arcuate at the front, straighter posteriorly; lateral margin, though narrow,

wider at the base, and bearing one seta on each side, near the middle; hind angles narrowly rounded, extending moderately beyond the basal line; disk almost smooth, very finely punctate at apex and sides, more coarsely so at the base.

Elytra oval, smooth, humeri rounded, margin near them even; striae obliterated, actually only traces of striae and fine, or heavier, transverse wrinkles at the basal part of elytra.

Ventral side brown, punctate and wrinkled, as in *luxatus*, but finer, proepisternum granulated, mesoepisternum with a few granules or deep punctures, metaepisternum, first abdominal segment, and sides of the other segments finely, not densely, punctate and wrinkled. Penis a little wider than in the northern forms of *luxatus* and other species of the same group, with broader tip (fig. 160). Legs slender, especially the hind ones; anterior tarsi of male with two or three segments bearing a dense brush underneath.

Length, 13-15 mm.; width, 6-8 mm.

DISTRIBUTION: Has been recorded only from Nevada.

Van Dyke (1943) compares this species with *latipennis* which is also smooth, but *lariversi* differs in having a narrower pronotum, with narrow hind angles extending beyond the basal line, and less projecting eyes, in the genitalia, and in other, minor characters. Actually, it is similar to *luxatus* and the rest of this group, in which it undoubtedly belongs. I have not seen the type, but the single specimen that I have examined fits very well the original description of *lariversi*.

***Callisthenes (Microcallisthenes) monticola* Casey**

Figures 54, 164, 165

Callisthenes monticola CASEY, 1897, p. 342. Type: Truckee River at Reno, Nevada.

Callisthenes nevadensis CASEY, 1913, p. 74. Type: Reno, Nevada.

DESCRIPTION: Black, some males rather slender, females stouter. Head punctate and rugose, especially at the front; eyes with two setae, often with three, seldom with four to six, near each; antennae, beginning with fifth segment, with distinct glabrous spots on each, some examples having two setae on the first antennal segment, instead of the usual one seta.

Pronotum one and a half times or nearly twice as wide as long in its widest place anterior to the middle, narrowed posteriorly, although some individuals with more evenly arcuate sides, less narrowed behind than in some examples of *luxatus*; lateral margin bearing four to five setae at the front part, two to three in the middle, and two to four near the hind angles, the latter narrowly rounded, projecting beyond the basal line; disk punctate and rugose, more so at the base and sides.

Elytra oblong-oval in males, more rounded in females; striae deep, usually regular, tegulae elongated, flat or convex, more prominent on sides and apex. The forms from Wyoming have shorter tegulae, and among the 80 beetles examined I have found one with very short, acute tegulae, not only on the sides and apex, but also on the disk.

Ventral side dark brown, proepisternum finely granulated, mesepisternum, metaepisternum, and sides of abdomen punctate and wrinkled, last abdominal segment with eight to 12 setae on the apex, and with two to four additional ones in the second row, closer to the middle of the segment; fourth and fifth segments with from two to 12 setae, one to six on each side. Among all species of the *luxatus* group, *monticola* has more numerous setae on the abdomen. Legs also with longer setae on the femur; anterior tarsi of males in some specimens entirely glabrous underneath, but in most individuals all three segments with a dense brush. Penis as in *luxatus*, but the tip often slightly truncate (figs. 164, 165); female genitalia slender, leaf-like process thin and pointed on the tip, with a long and deep furrow; basal sclerites of genitalia convex, with sharp ridge.

Length, 15–18 mm.; width of males, 6.5–7.5 mm.; width of females, 7.5–8.5 mm.

DISTRIBUTION: Western states. California: Eldorado County: Cedar Peak; Lassen County: Doyle, Hallelujah Junction; Plumas County: Clover Valley, Meadow Valley, Quincy; Yolo County: Davis. Nevada: Ormsby County: Spanish Spy Valley; Storey County: Wadsworth; Washoe County: Pyramid Lake, Reno, Verdi, Winnemucca Valley. Washington: Ellensburg, Pasco. Wyoming (no specific locality given). According to Hatch (1953), also in the eastern part of

Washington State, Idaho, eastern Oregon, and British Columbia, Canada.

The elytral sculpture of different forms of *monticola* varies greatly, and for this reason Casey (1897, 1913) described two forms, *monticola* and *nevadensis*, as two different species. Indeed the *monticola* type has very flat tegulae and two setae near each eye, while the *nevadensis* type has convex tegulae and three setae near each eye. Only in a series of examples is it possible to see that these forms are actually variations of the same species.

In spite of the distinct variations in the elytral sculpture, *monticola* is easily distinguishable from all other closely related species. From *pimelioides* it differs in the number of setae near the eyes (*pimelioides* has one seta near each eye), in more numerous setae on the abdominal segments, in longer setae on the femur, and in more elongated elytral tegulae. In the same characters it differs from the other species of the *luxatus* group, and in addition in having more numerous setae on the pronotum.

It is not a synonym of *luxatus*, as stated by Jeannel (1940). I believe it is a separate species and certainly the one most easily distinguishable from the whole group.

MATERIAL EXAMINED: Eighty specimens.

***Callisthenes (Microcallisthenes) subasperatus*
Schaeffer**

Figure 169

Calosoma subasperatum SCHAEFFER, 1915, p. 235. Type: California.

Callisthenes klamathensis CASEY, 1920, p. 169. Type: Klamath County, Oregon.

DESCRIPTION: Similar to *monticola*, but with one seta near each eye; black, very shining. Head wrinkled and sparsely, finely punctate; labrum slightly curved at margin; mandibles stout, moderately strigose; antennae with large, glabrous spots on all segments, beginning with the fifth.

Pronotum twice, or a little less than twice, as wide as long, the widest part anterior to the middle; sides arcuate at the front and straighter posteriorly; lateral margin with four to eight setae at the front part, and one seta near each hind angle; hind angles narrowly rounded and extending decidedly beyond the basal line; disk moderately densely

and finely punctate and wrinkled, with coarser punctures at the base.

Elytra oblong-oval; tegulae flat, towards the sides and apex more convex; minute, scattered punctures visible in the wrinkles and striae.

Ventral side as in *luxatus*, punctate and wrinkled on sides.

Length, 13–15 mm.; width, 7–8 mm.

DISTRIBUTION: Not very common; has been recorded from the western states. California: Siskiyou County: Dorris. Oregon: Harney County: Stinking Water Creek; Klamath County.

This species belongs to the part of the *luxatus* group in which the beetles have erect setae on the front part of the pronotum, such as *pimelioides* and *monticola*. The difference between *subasperatus* and the other two species is that *subasperatus* has minute punctures scattered along the striae and in the transverse wrinkles of the elytra, punctures that are never found in *pimelioides* or in *monticola*. In addition *pimelioides* has convex elytral tegulae, while *subasperatus* has the tegulae flat. As for *monticola*, which also may have flat tegulae, it has several setae near each eye, and *subasperatus* has only one seta near each eye.

Jeannel (1940) placed *subasperatus* as a synonym of *luxatus*. Breuning (1928b) considered it an aberration of *zimmermanni*. It is different from both of them, being more like *pimelioides*. I consider it a different species, but I have seen only three specimens, and it is possible that it is a form of *pimelioides*. *Callisthenes* (*Microcallisthenes*) *subasperatus* occurs in Oregon, where apparently *pimelioides* is absent, and penetrates into northern California, where it intergrades with *pimelioides*.

Casey's *klamathensis* from Klamath County, Oregon, agrees well with Schaeffer's description of *subasperatus* and is a synonym.

MATERIAL EXAMINED: Three specimens.

Callisthenes* (*Microcallisthenes*) *pimelioides
Walker

Figures 53, 170

Calosoma pimelioides WALKER, 1866, p. 312.
Type: Vancouver Island.

Callisthenes tegulatus CASEY, 1913, p. 72. Type: California.

Callisthenes viator CASEY, 1913, p. 72. Type: California.

Callisthenes pustulosus CASEY, 1913, p. 73. Type: Yreka, California.

Callisthenes reflexus CASEY, 1920, p. 164. Type: Northern Rocky Mountains.

Callisthenes parowanus CASEY, 1920, p. 167. Type: Parowan, Utah.

DESCRIPTION: Black or brownish black. Head usually densely punctate, at the front rugose and with confluent punctures; labrum with almost even margin; eyes slightly projecting and with one seta near each; mandibles strigose and, in some specimens, with sparse punctures; antennae with glabrous spots distinct usually on each segment, beginning with the fifth.

Pronotum scarcely narrowed posteriorly, sides slightly arcuate; in the widest place pronotum twice as wide as long or nearly so; six to eight setae at the front part of the lateral margin, and one to two setae near the hind angles, which are narrowly rounded, projecting beyond the basal line; entire pronotum densely punctate and wrinkled, in some individuals disk smoother.

Elytra oval, striae deep, regular or slightly confused; interstices with transverse wrinkles and creases forming tegulae, which are convex.

Ventral side brownish black; proepisternum, mesoepisternum, and metaepisternum, as well as sides of abdomen, punctate and wrinkled; last abdominal segment finely punctate and bearing the same quantity of setae as *luxatus*, same as fourth and fifth segments. Penis with a shorter tip than in *luxatus* and slightly truncate at the end (fig. 170). I have examined 20 males from different localities, and all have the same type of penis; the female genitalia are as in the *luxatus* forms from the north.

Length, 14.5–19.5 mm.; width, 6–8 mm.

DISTRIBUTION: Western part of the United States and southwestern Canada. California: Humboldt County; Lassen County: Norval Flats, Yreka; Modoc County; Plumas County: Clover Valley, Meadow Valley; Shasta County. Idaho: Montana: Wisdom. Nevada: Utah: Parowan. Washington: Canada: Alberta: Medicine Hat; southwestern British Columbia; Vancouver Island.

Casey's *pustulosus* from Yreka, California, differs from *pimelioides* in having the pronotum narrower behind, and often in smaller size. I have seen examples like this collected from California and Nevada. I think it is a variation of *pimelioides* and therefore a synonym.

Among the species of the *luxatus* group *pimelioides* is easily distinguished by the erect setae at the front part of the pronotum; even if some of the setae have fallen off, the remaining ones are clearly visible. From *monticola*, which also has erect setae at the front of the pronotum, *pimelioides* differs in the number of setae near the eyes, *monticola* having two to six setae near each eye, *pimelioides* only one seta; also the pronotum in *monticola* is more narrowed behind, the elytral tegulae longer than in *pimelioides* and often flat on the disk. From *subasperatus*, which also has one seta near each eye, *pimelioides* differs in the convex elytral tegulae and absence of punctures in the striae and in the transverse wrinkles; *subasperatus* has flat tegulae and the elytra sprinkled with minute punctures.

Casey's *viator* and *tegulatus*, both from California, are the same as *pimelioides*; *viator* has several setae at the front part of the pronotum, though a little closer to the middle, and *tegulatus* has the remains of setae at the front. I think they are synonyms of *pimelioides*.

Casey's *parowanus* from Parowana, Utah, is a synonym more likely of *pimelioides* than of *zimmermanni*, as stated by Breuning (1928b). It also has setae at the front part of the side margin of the pronotum.

The form *reflexus* Casey, from the northern Rocky Mountains, has a blue luster at the base of the pronotum and several setae at the front part of the lateral margin, though a little closer to the middle. It is probably a variation of *pimelioides*.

MATERIAL EXAMINED: Eighty-five specimens.

***Callisthenes (Microcallisthenes) oregonus*,
new species**

Figures 50, 56, 171

DESCRIPTION OF TYPE, MALE: Black, head finely, densely punctate; eyes with one seta

near each; labrum curved at margin; mandibles slender, slightly strigose; antennae with glabrous spots, fifth segment with only a little pubescent spot on the inner side, otherwise glabrous.

Pronotum in its widest place anterior to the middle a little less than twice as wide as long, narrowed posteriorly; sides arcuate at the front and straighter behind, with one seta at middle of lateral margin; hind angles projecting beyond basal line, narrowly rounded (obtuse angles); disk finely punctate, with confluent punctures and heavy wrinkles at the base.

Elytra oval, striae regular and deep; interstices with convex tegulae, more elongated than in *luxatus*, becoming more acute towards sides and apex; foveae absent.

Ventral side dark brown, proepisternum punctate, even slightly granulated; mesoepisternum, metaepisternum, and sides of abdomen punctate and wrinkled; last abdominal segment with 10 setae on apex and two additional setae in second row, closer to middle of segment; third, fourth, and fifth segments with two setae each; anterior tarsi with three segments dilated and a dense brush underneath, which covers fully each of the three segments. Penis with a small, button-like tip and short inner armature (fig. 171).

Length, 20 mm.; width, 9 mm.

The type comes from Oregon without specific locality, and is in the collections of the Staten Island Museum of Arts and Sciences, New York. The allotype, a female, also from Oregon, does not differ from the type in external characters. The genitalia are as in *luxatus* from Washington State, the leaf-like process slender and with pointed tip. The paratypes, two males, are also from Oregon, and hardly differ from the type, only the elytral striae being a little confused on the sides and apex; length, 18–20 mm.

This species is similar to *luxatus* but is more slender, with more elongated elytral tegulae and quite different penis. The penis of *luxatus* is narrowed gradually towards the tip, while in *oregonus* the tip is slightly enlarged, button-like, and much shorter than in *luxatus*. From *zimmermanni* this species is distinguished by large size and by the form of the

penis, which in *zimmermanni* is as in *luxatus*, and by the inner armature of the penis, which is very long in *zimmermanni* and short in *oregonus*. Some forms of *monticola* and *luxatus* from Wyoming have approximately the same kind of penis as *oregonus*, but the tip is larger and not button-like. They also differ from *oregonus* in external characters; *monticola* is smaller, more slender, and has several setae near each eye and at the front part of the lateral margin of the pronotum; *luxatus* from Wyoming is smaller, less convex, and has flat tegulae, with punctures in the striae.

MATERIAL EXAMINED: Four specimens.

Callisthenes (Microcallisthenes) zimmermanni

LeConte

Figures 57, 172

Carabus zimmermanni LECONTE, 1848, p. 445. Type: Northern Rocky Mountains.

Carabus opacus GÉHIN, 1885, p. 70. Type: Oregon.

Callisthenes exaratus CASEY, 1913, p. 12. Type: Placer County, California.

Callisthenes debilis CASEY, 1920, p. 169. Type: Oregon.

Calosoma zimmermanni tahoensis VAN DYKE, 1943, p. 18. Type: Lake Tahoe, California.

DESCRIPTION: Small, black beetles, with pronotum narrowed posteriorly and often with blue luster at the base of pronotum and on elytral margin near humeri. Head finely punctured and wrinkled; labrum curved at the margin; mandibles strigose, in some individuals very lightly so; eyes with one seta near each; antennae with elongated, glabrous spots on fifth and following segments, often the fifth segment glabrous on outer side.

Pronotum in its widest place anterior to the middle one and one-half times or nearly twice as wide as long, narrowed posteriorly, sides arcuate at the front and straighter behind; lateral margin narrow, with one seta in the middle, in a few specimens with a second seta near hind angles (in some forms from California); hind angles as obtuse triangles, extending decidedly beyond the basal line; disk punctate and wrinkled, at the base rugose.

Elytra oval, with rounded, almost non-existent humeri and even margin near them; striae deep, regular or slightly confused, tegulae convex, rounded or more elongated, acute towards sides and apex.

Ventral side brownish black; proepisternum smooth, mesoepisternum, metaepisternum, and sides of abdomen punctate and wrinkled; last abdominal segment bearing up to eight setae on the apex, and often with two additional ones in second row, closer to middle of segment; fourth and fifth segments, as in *luxatus*, with two, rarely four, setae each. Tip of penis long and rounded at the end, inner armature very long (fig. 172); this character is constant and helps to distinguish *zimmermanni* from all other species of the *luxatus* group. The female genitalia not different from those in the northern forms of *luxatus*. Anterior tarsi of male with three segments dilated and underneath fully covered by a dense brush of hair.

Length, 13–17 mm.; width, 4.5–7.5 mm.

DISTRIBUTION: Western United States and southwestern Canada. California: Alpine County: Sonora Pass, White Mountains; Eldorado County: Tallac; Inyo County; Mono County: Mammoth; Placer County: Lake Tahoe; Sonoma County: Donahue Pass; Tuolumne County: Cow Creek. Idaho: Gooding County: Bliss. Nevada: Humboldt County: Paradise. Utah: Hatch (1953) gives the following localities: Eastern Oregon, Idaho, and British Columbia, Canada. According to Burgess and Collins (1917), it is found also in Kansas, Montana, Washington, and Wyoming. Breuning (1928b) states that *zimmermanni* occurs from Vancouver Island to Mexico. However, it is very doubtful that *zimmermanni* spreads so far to the south. It is more abundant in the central part of California than in the southern part, and it has not been recorded in Arizona. Breuning mistook *pimelioides* for *zimmermanni* and described the latter as a form with numerous setae on the pronotum, whereas *zimmermanni* has only one seta on each side.

This species is similar to individuals of *luxatus* from Oregon, but it is smaller and more slender. In some instances it is difficult to separate the two species, if there are not, in the series, typical, stouter *luxatus*, or if the genitalia of the males are not examined.

Jeannel (1940), as usual, placed *zimmermanni* as a synonym of *luxatus*, which is not correct, as *zimmermanni* is more slender, has a narrower pronotum, more elongated tegulae, and longer inner armature of the penis.

As in the case of *luxatus*, *zimmermanni* shows geographical variations. The pygmy form, described by Van Dyke (1943) as subspecies *tahoensis*, from Lake Tahoe, which is found in high altitudes, mostly in the middle Sierras, is more gracefully formed, has the head moderately densely punctate, in some individuals only sparsely punctured; has the pronotum narrow, not more than one and a half times as wide as long; the elytra with regular, never confused striae; and elongated tegulae. The length is not more than 15–16 mm.; the width, about 7 mm.

Van Dyke (1943) stated that the specimens found in the Gold Belt of the foothill region to the west of Lake Tahoe resemble Casey's *exaratus*. They have the same narrow pronotum as *tahoensis*, but the head and pronotum are more densely punctate, the elytral striae are, in some examples, slightly confused, and the elytral tegulae are shorter.

Some individuals from Mono County, California, have large, wide, and separated tegulae and very regular striae. Those collected in Bliss, Gooding County, Idaho, and in Paradise, Humboldt County, Nevada, often have flat tegulae, as in *monticola* Casey. Van Dyke

(1943) also stated that *zimmermanni* found in the Great Basin to the east is like *monticola*.

Calosoma tahoensis Van Dyke, described above, is a remarkable variation of *zimmermanni* which could be left as a subspecies if other forms were not found so close to it, or almost in the same localities with it (White Mountains, Mono County, Placer County).

Casey's *exaratus* from Placer County, California, is a synonym of *zimmermanni*. I have not found much difference between the types of *exaratus* and *zimmermanni*, except that *exaratus* has a slightly narrower pronotum, as in *tahoensis*.

Géhin's *opacus*, according to Breuning (1928b), is also a synonym of *zimmermanni*, differing from the latter in the more rounded hind angles of the pronotum and larger elytral tegulae. I have not seen this type, but it is possible that it is the same form as Casey's *debilis* (a male from Oregon) which I have examined. It also has rounded hind angles of the pronotum. Otherwise it is like *zimmermanni* and, I believe, a synonym.

MATERIAL EXAMINED: Sixty specimens.

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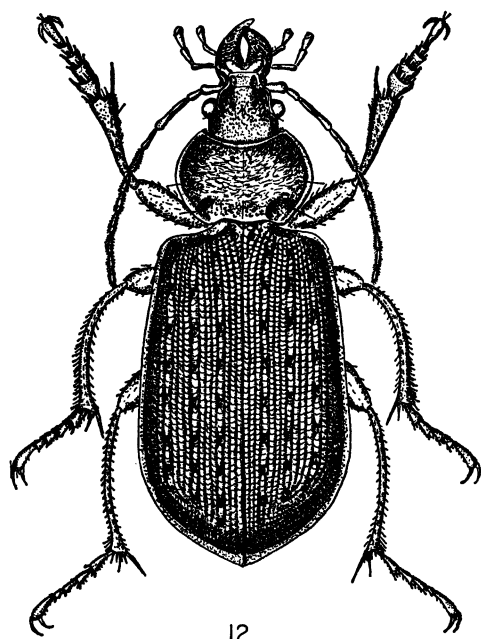
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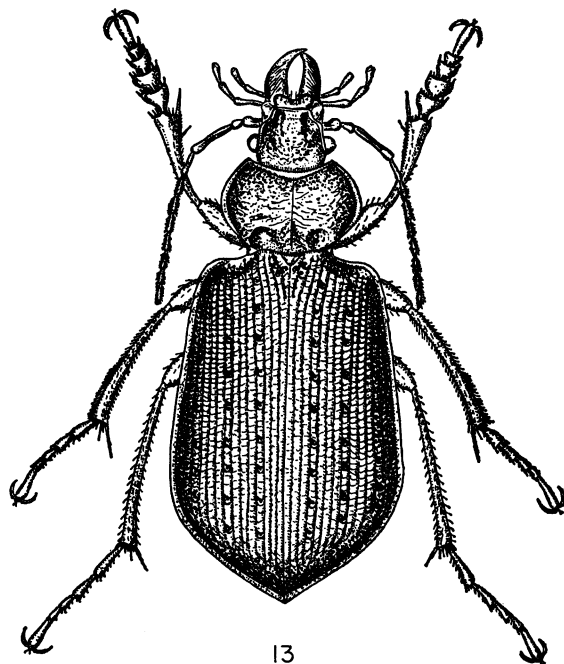
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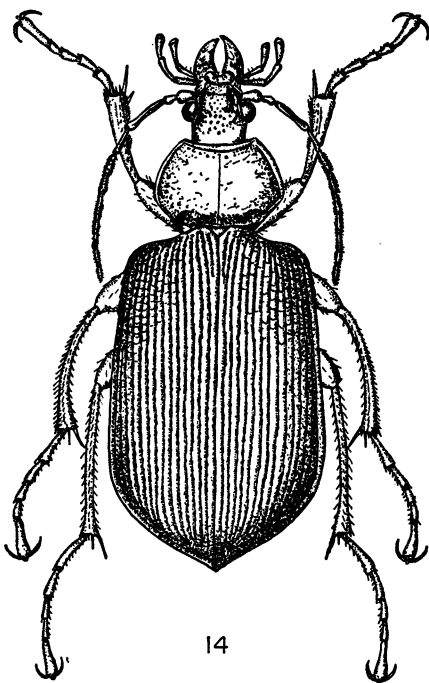
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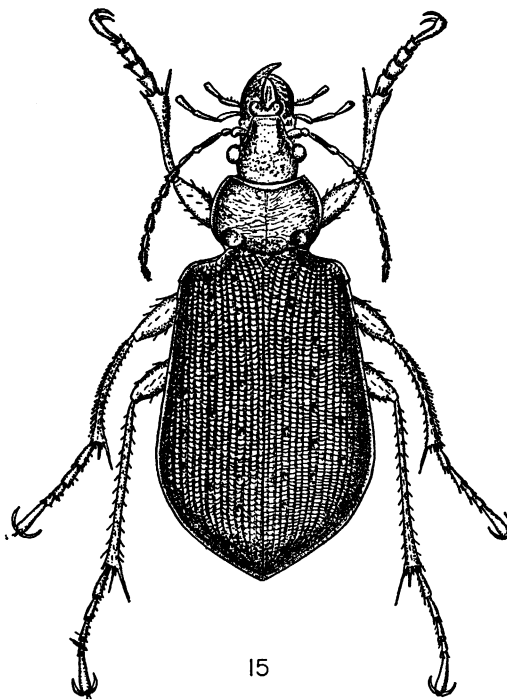
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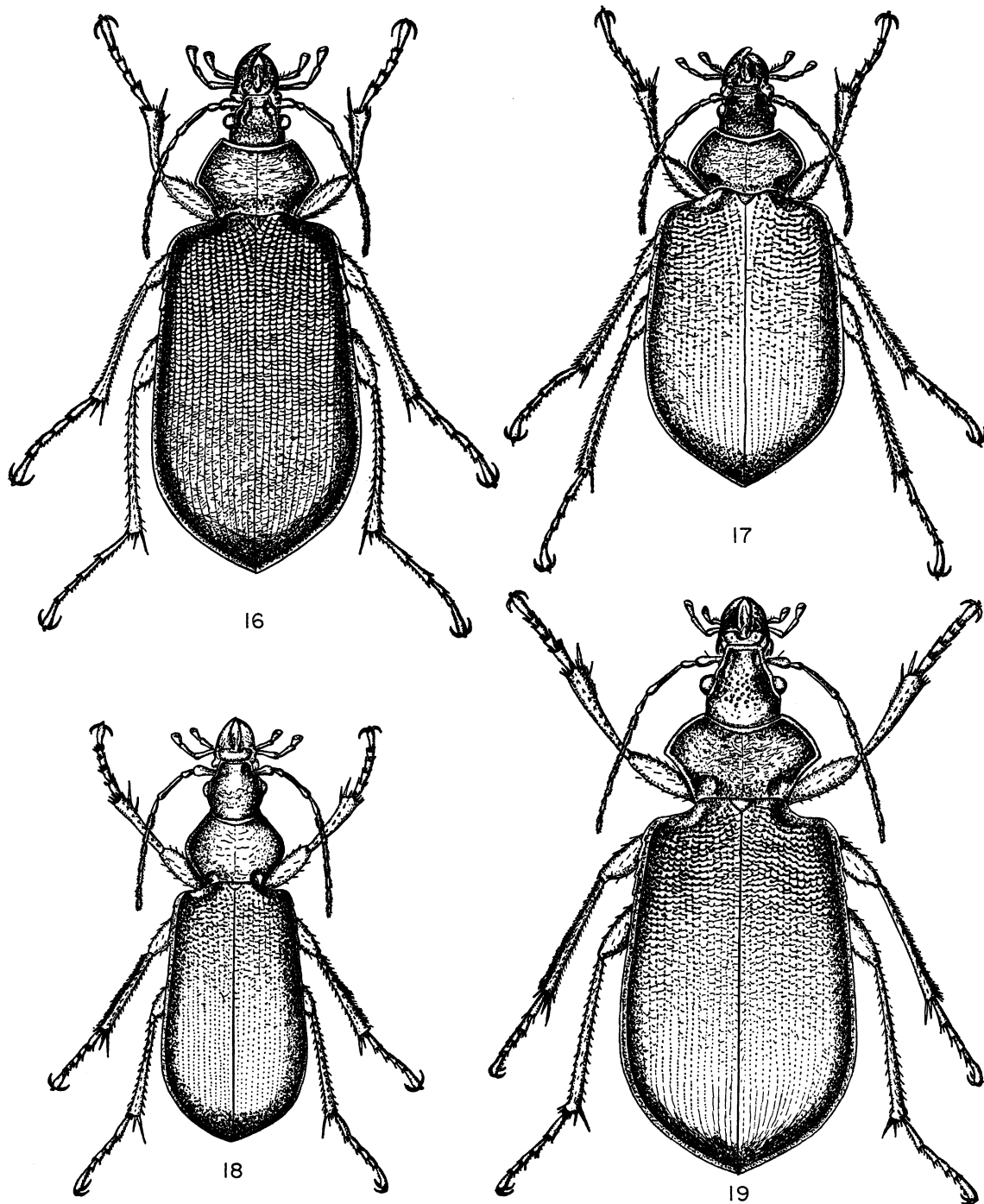


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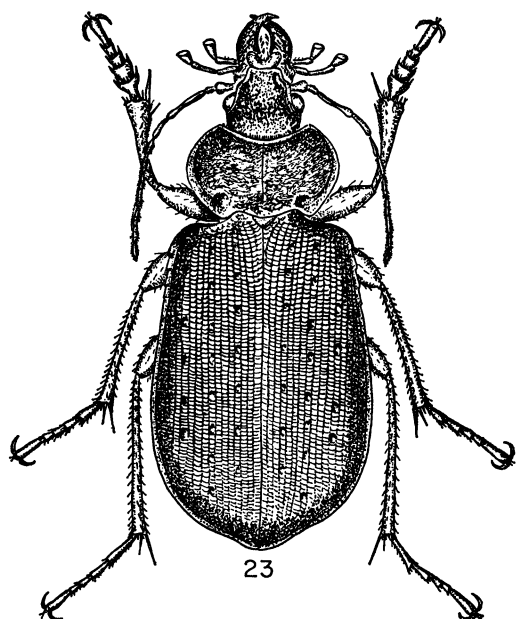
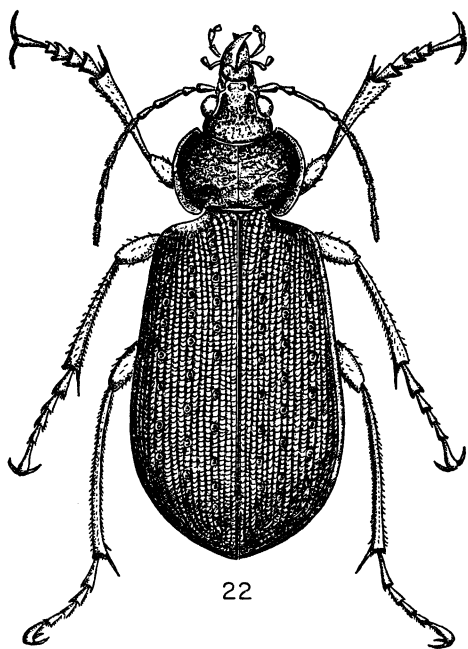
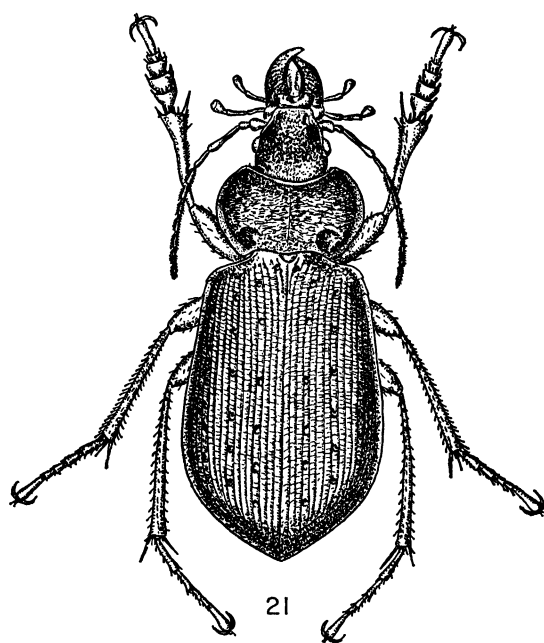
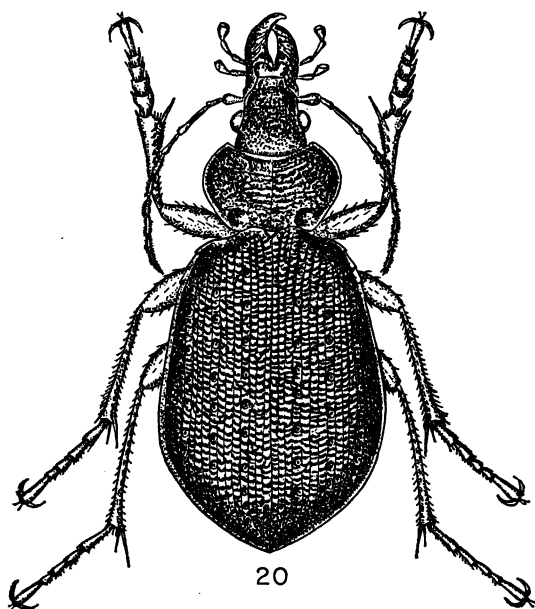


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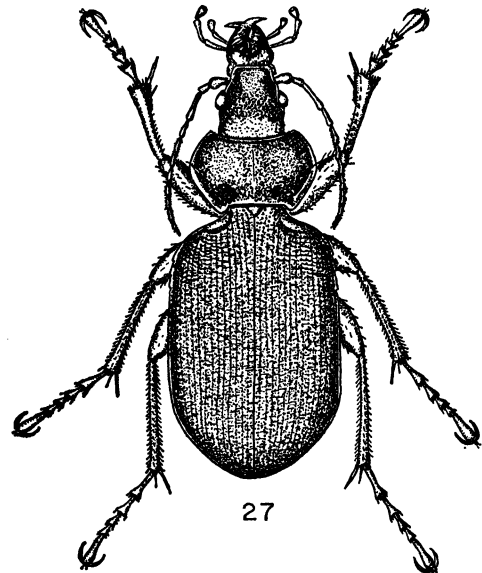
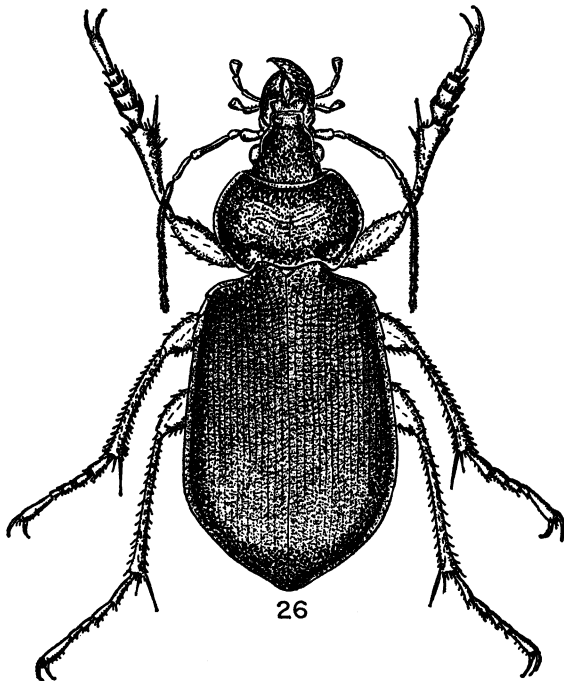
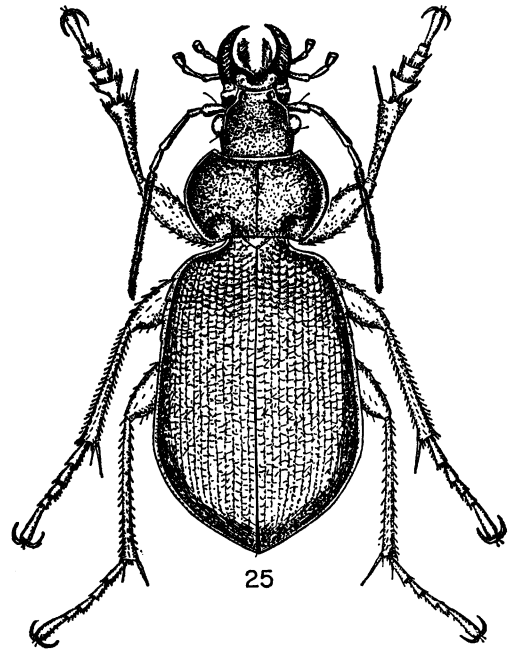
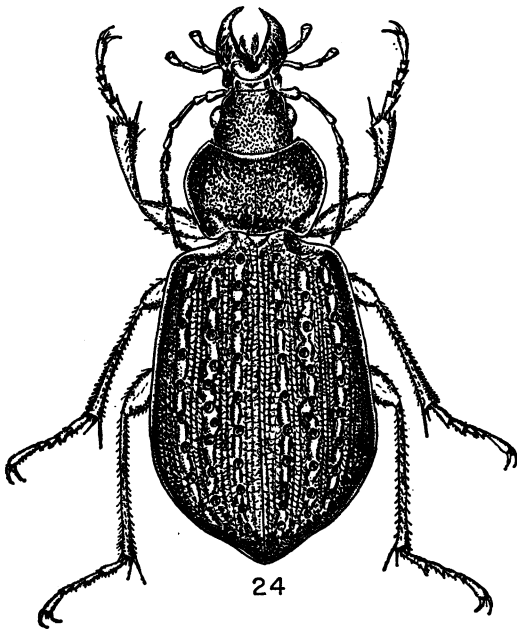
FIGS. 12-15. Dorsal views. 12. *Calosoma* (*Castrida*) *alternans sayi* Dejean. 13. *C.* (*Calosoma*) *frigidum* Kirby. 14. *C.* (*Calodrepa*) *aurocinctum* Chaudoir. 15. *C.* (*Calodrepa*) *wilcoxi* LeConte.



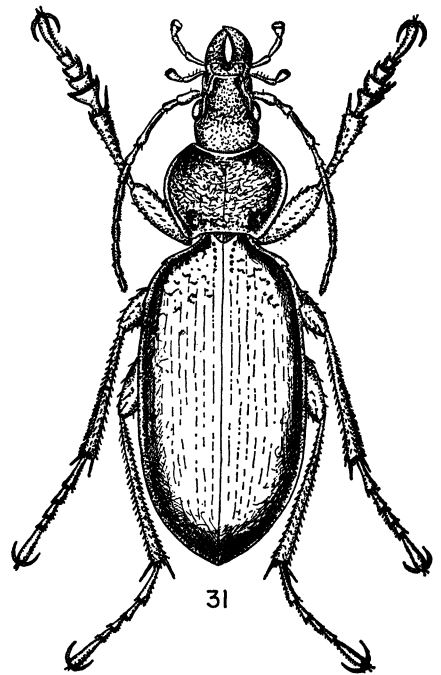
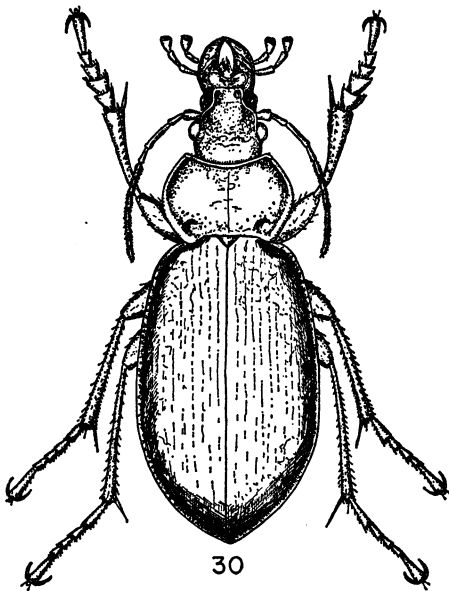
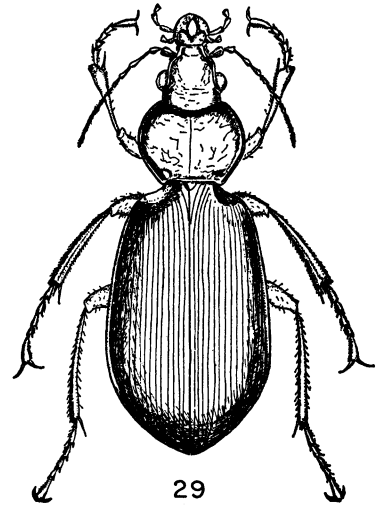
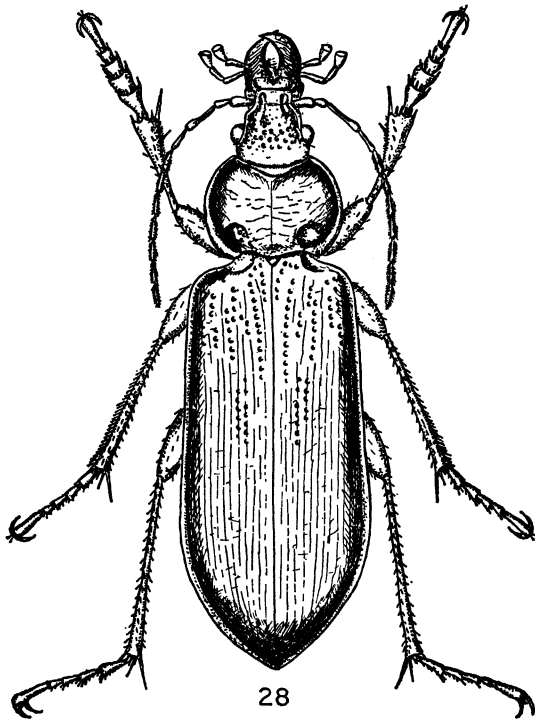
FIGS. 16-19. Dorsal views. 16. *Calosoma* (*Camegonia*) *parvicollis* Fall. 17. *C.* (*Camedula*) *eremicola* Fall. 18. *C.* (*Camedula*) *sponsa* Casey. 19. *C.* (*Camegonia*) *prominens* LeConte.



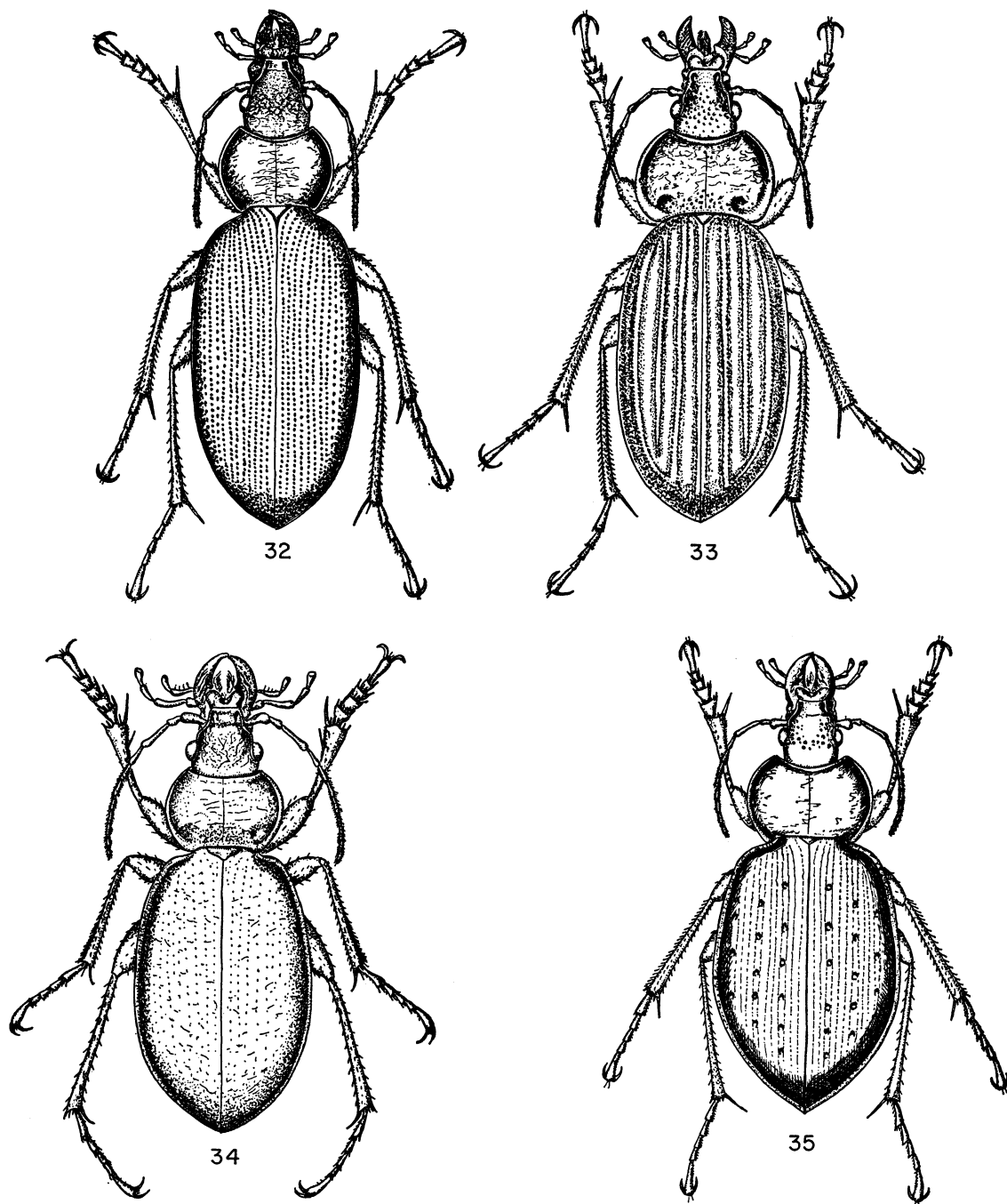
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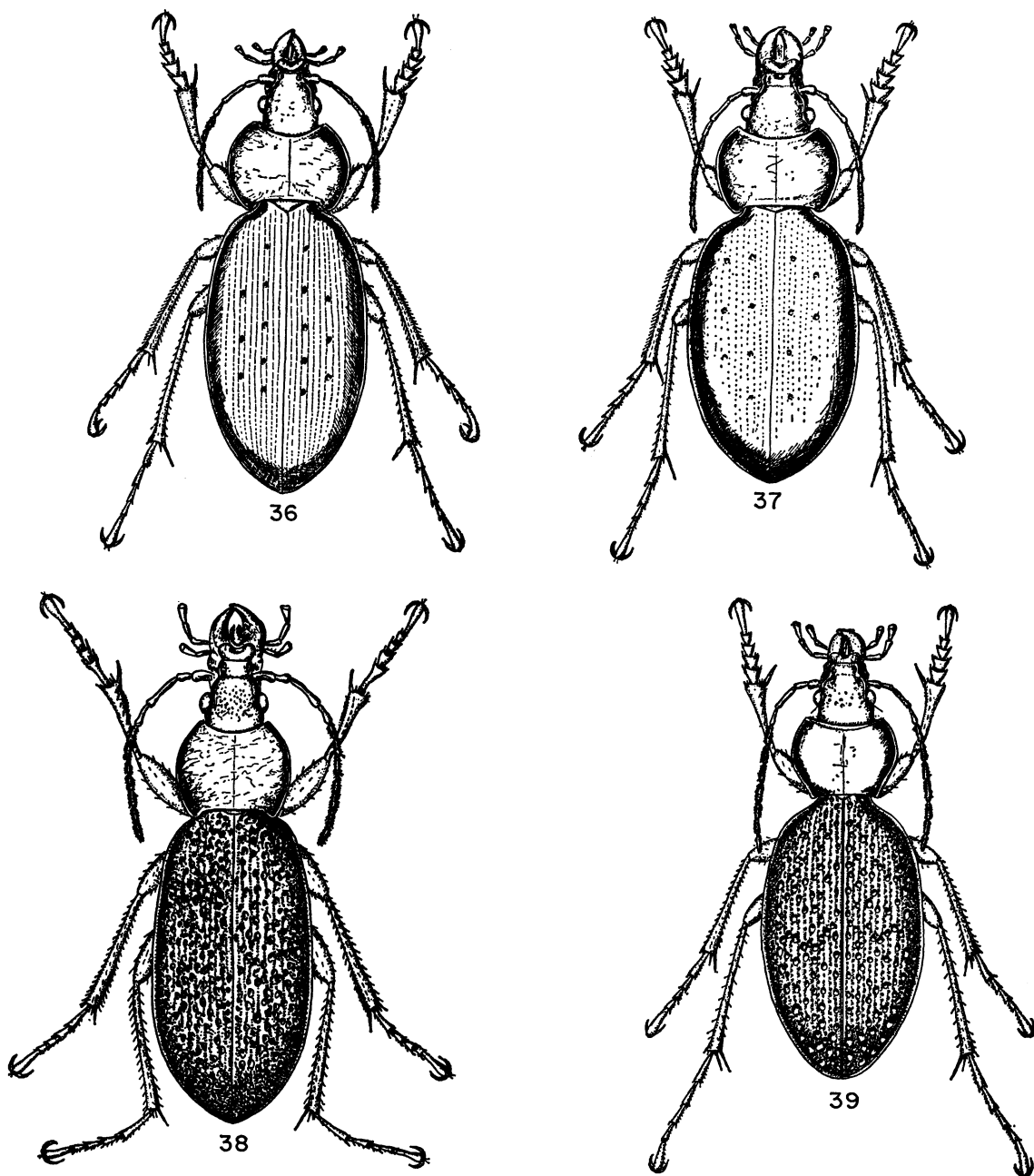
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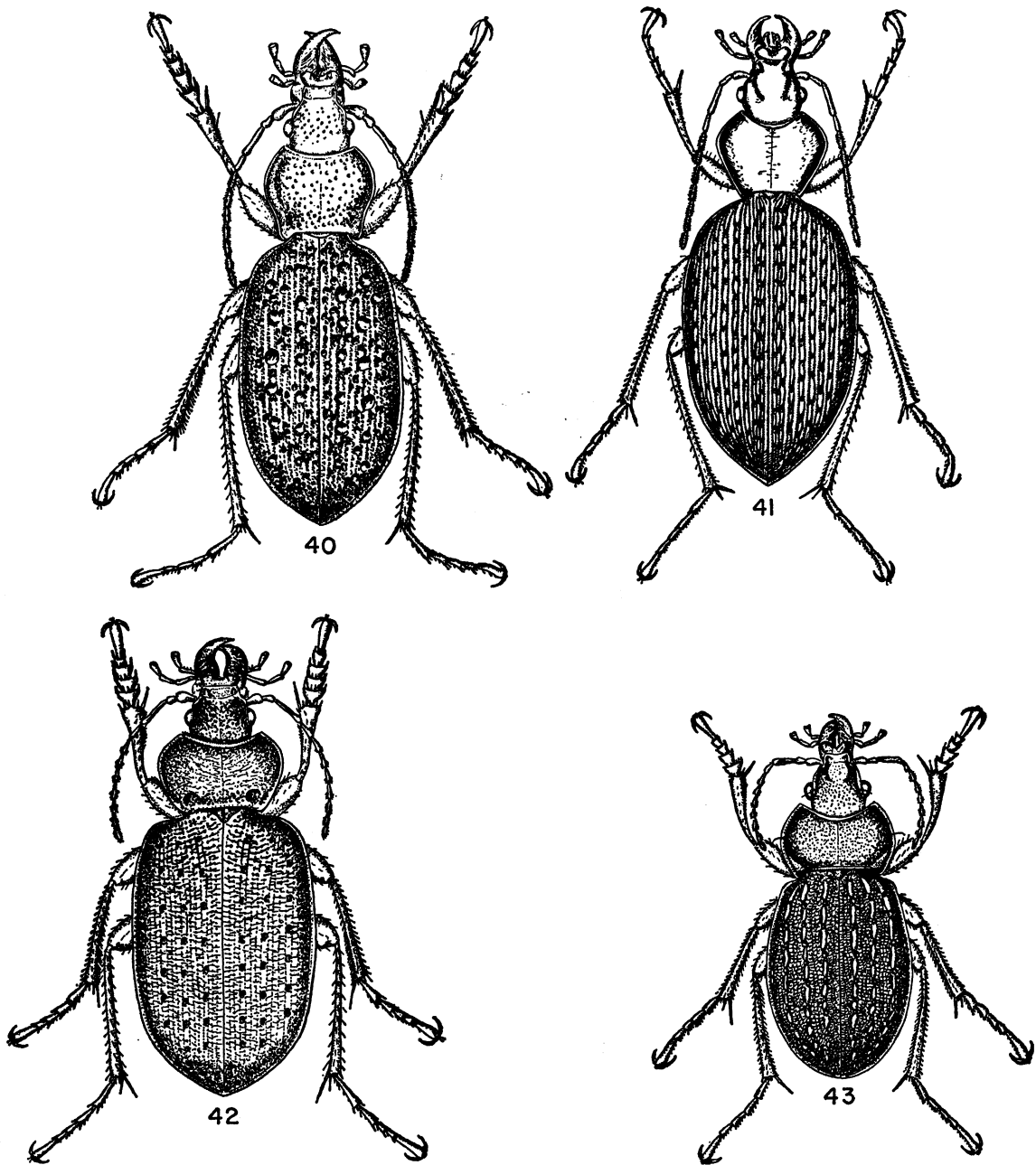
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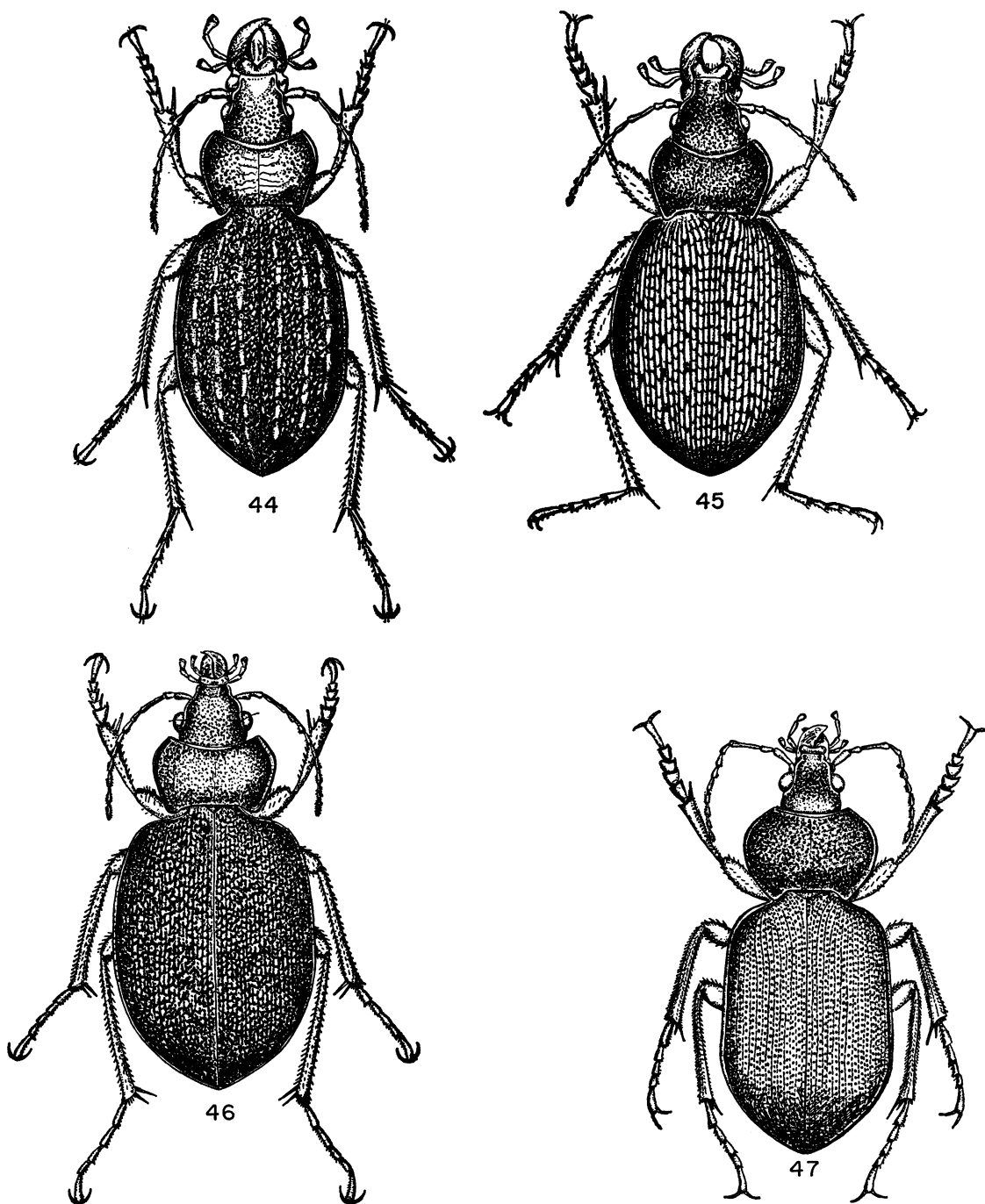
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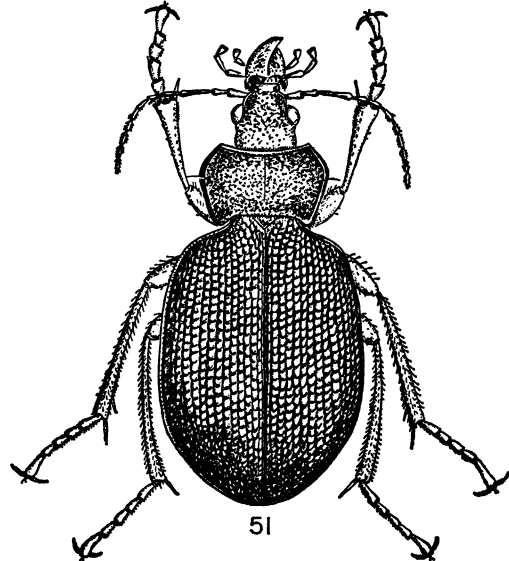
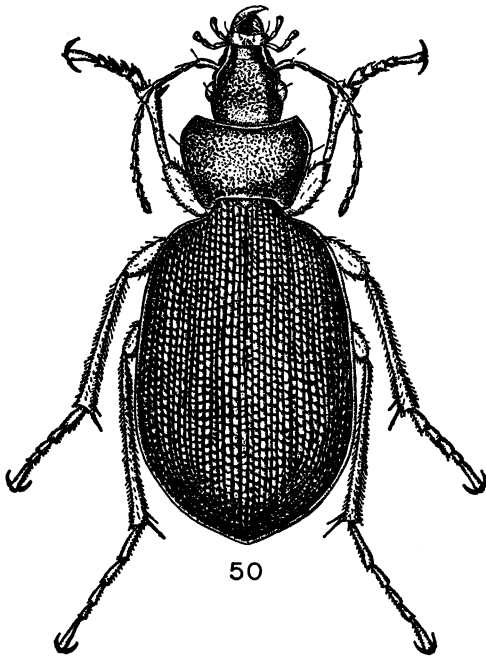
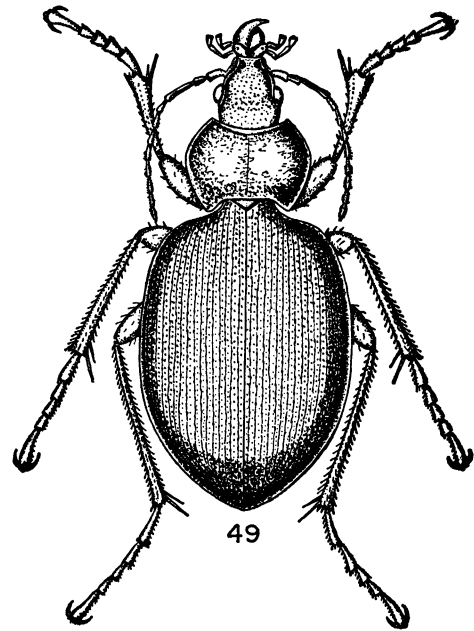
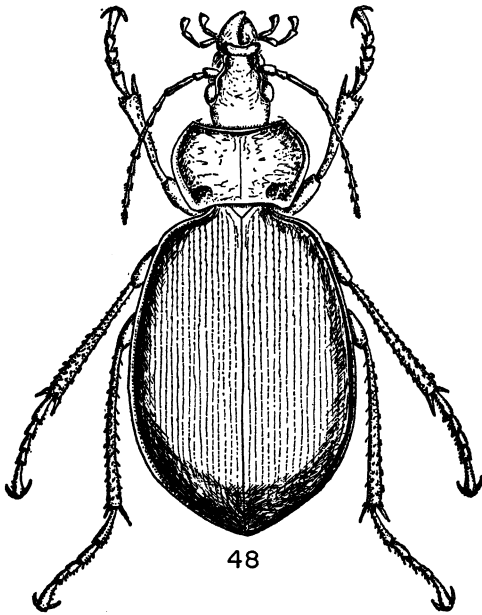
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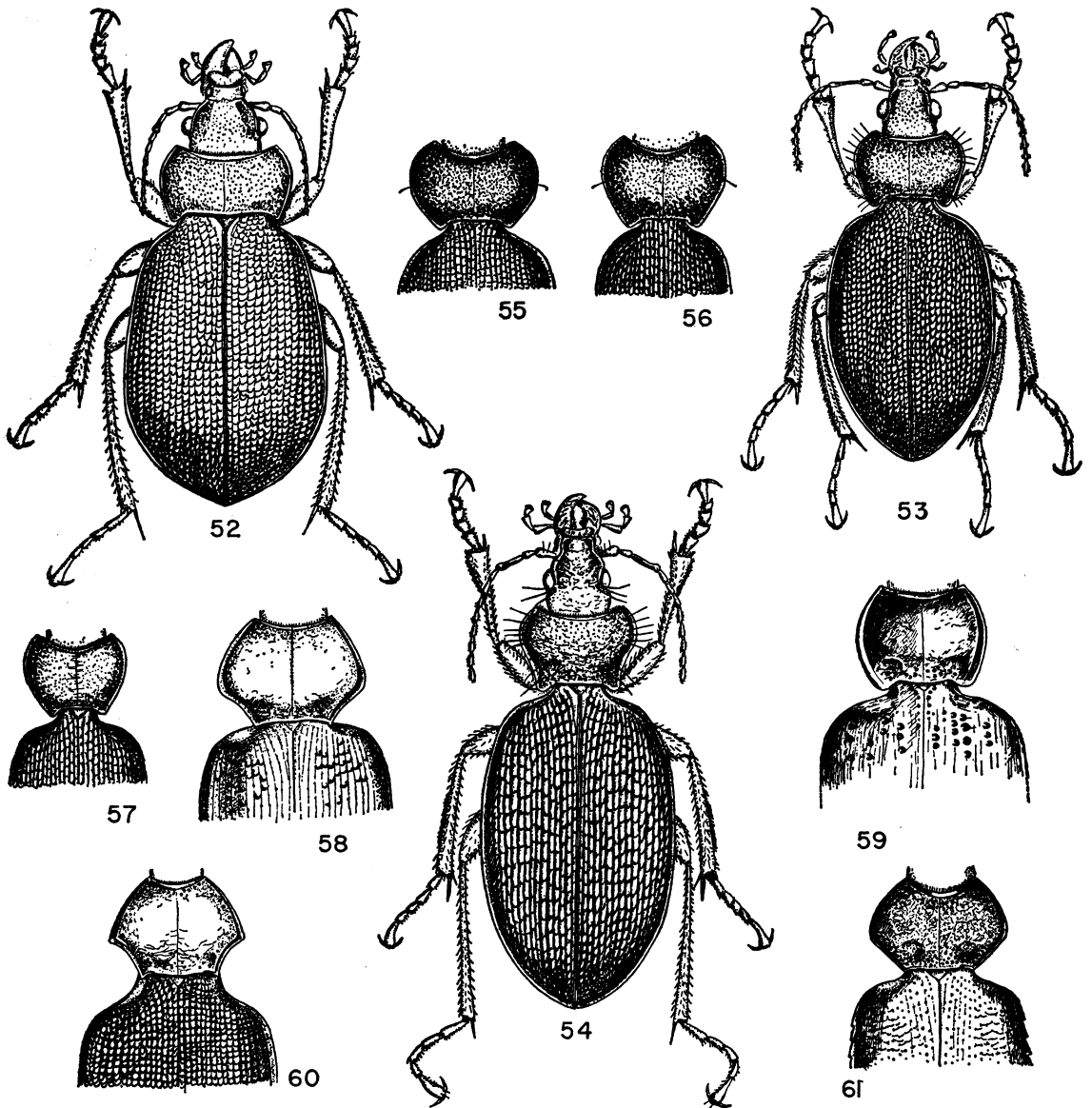
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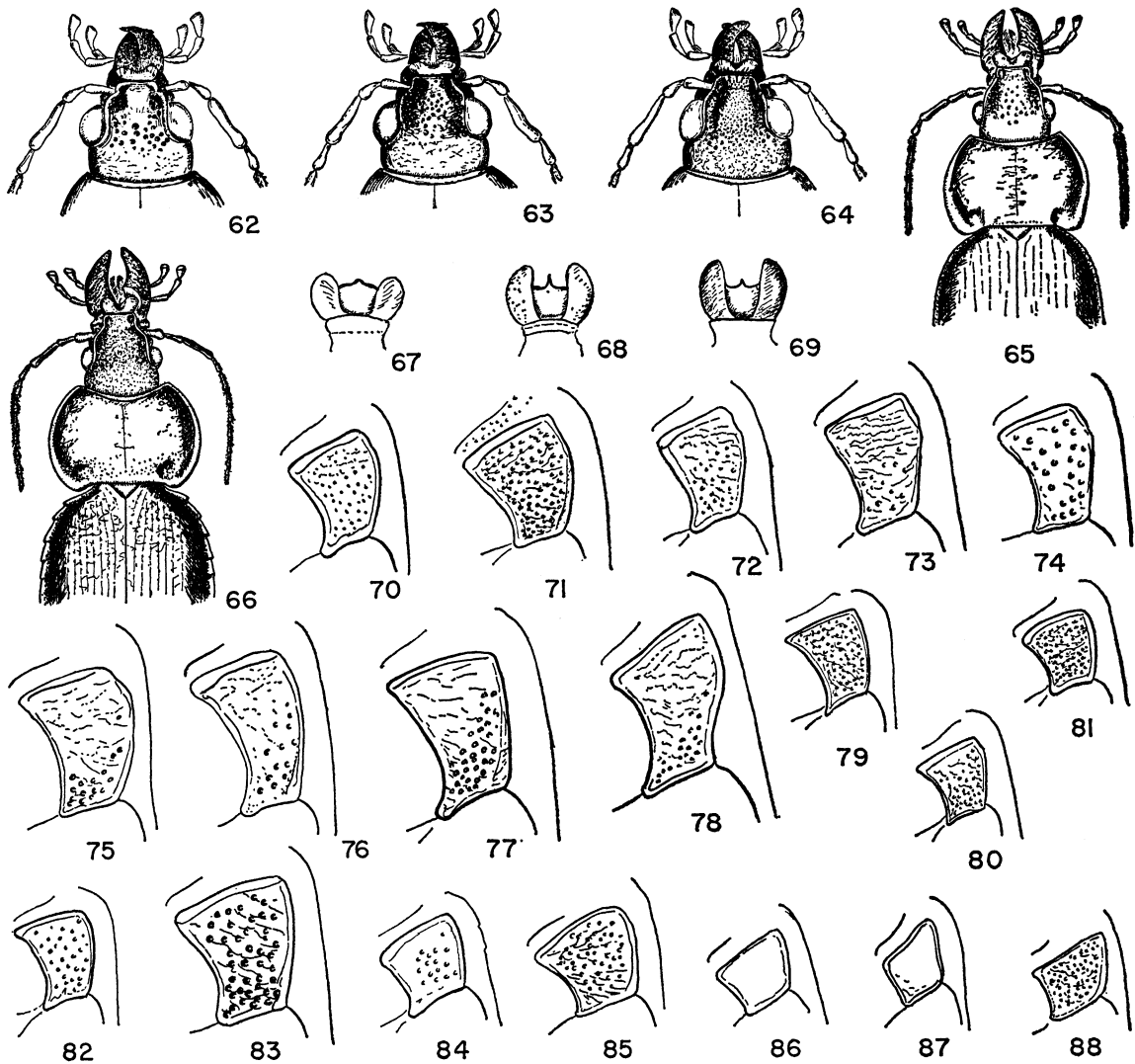


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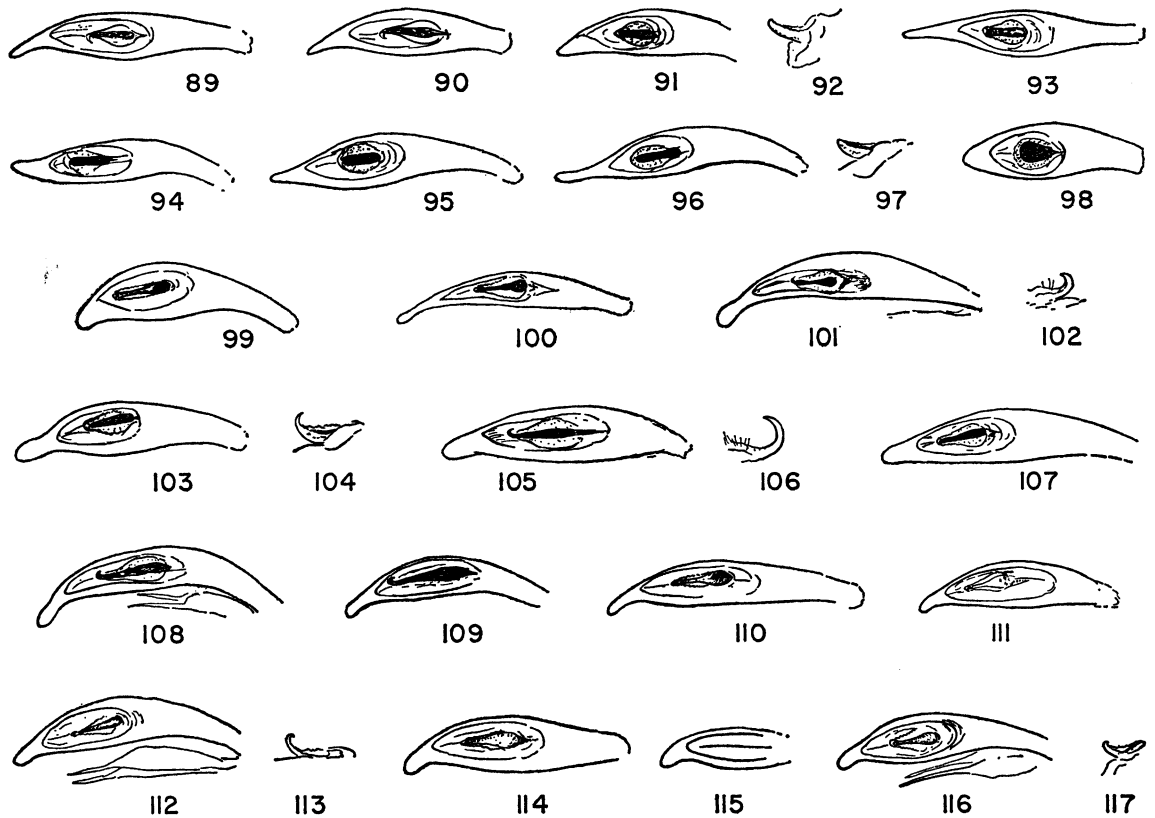


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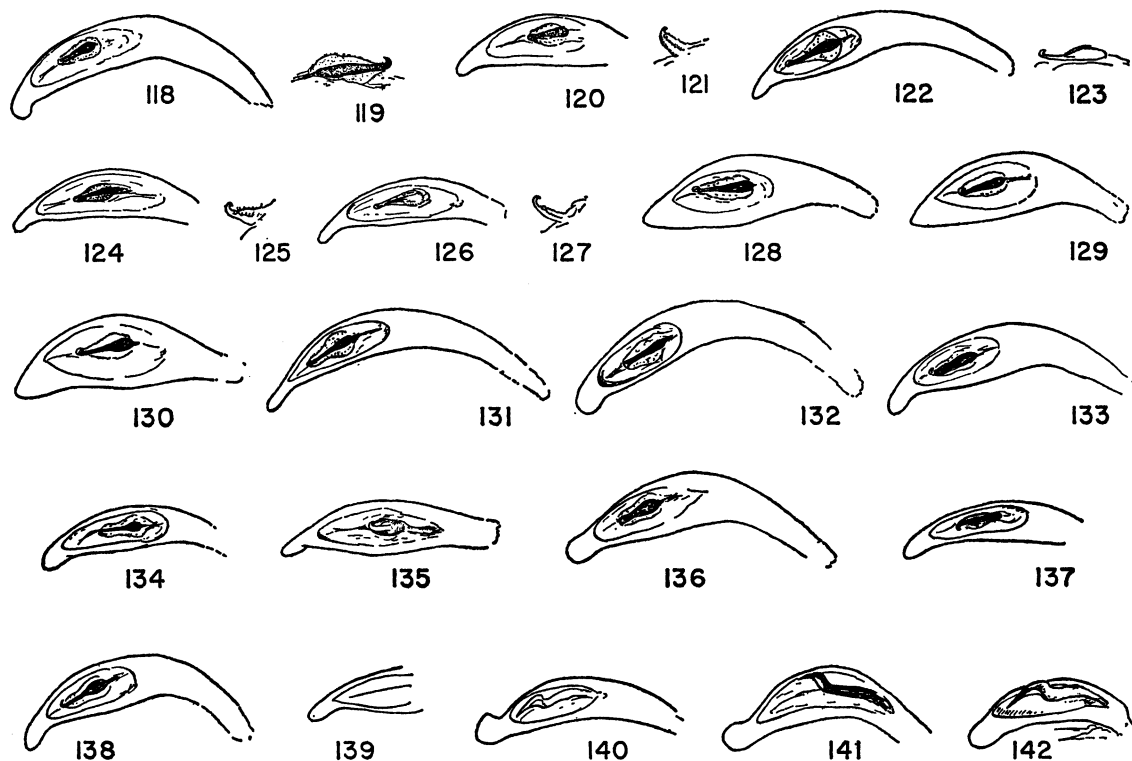
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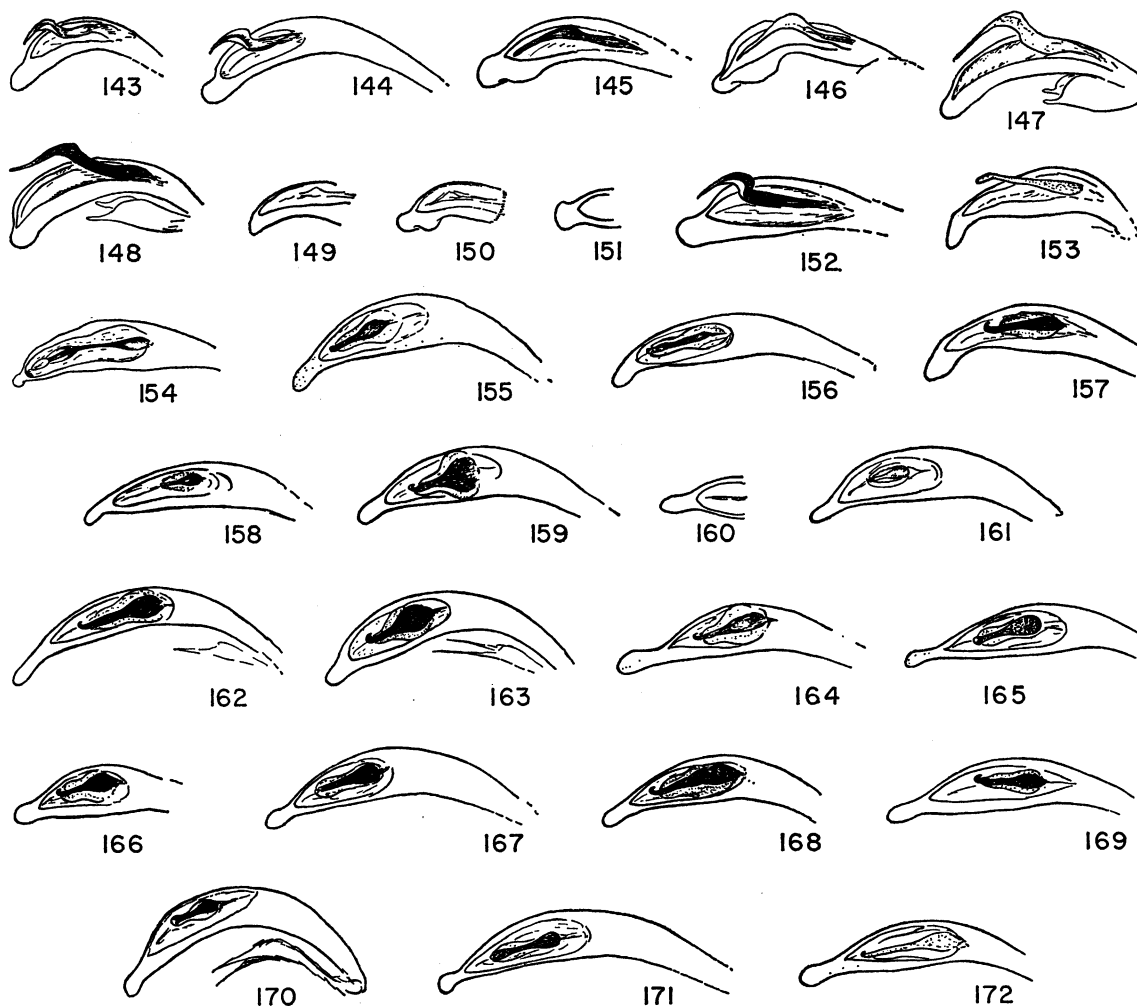
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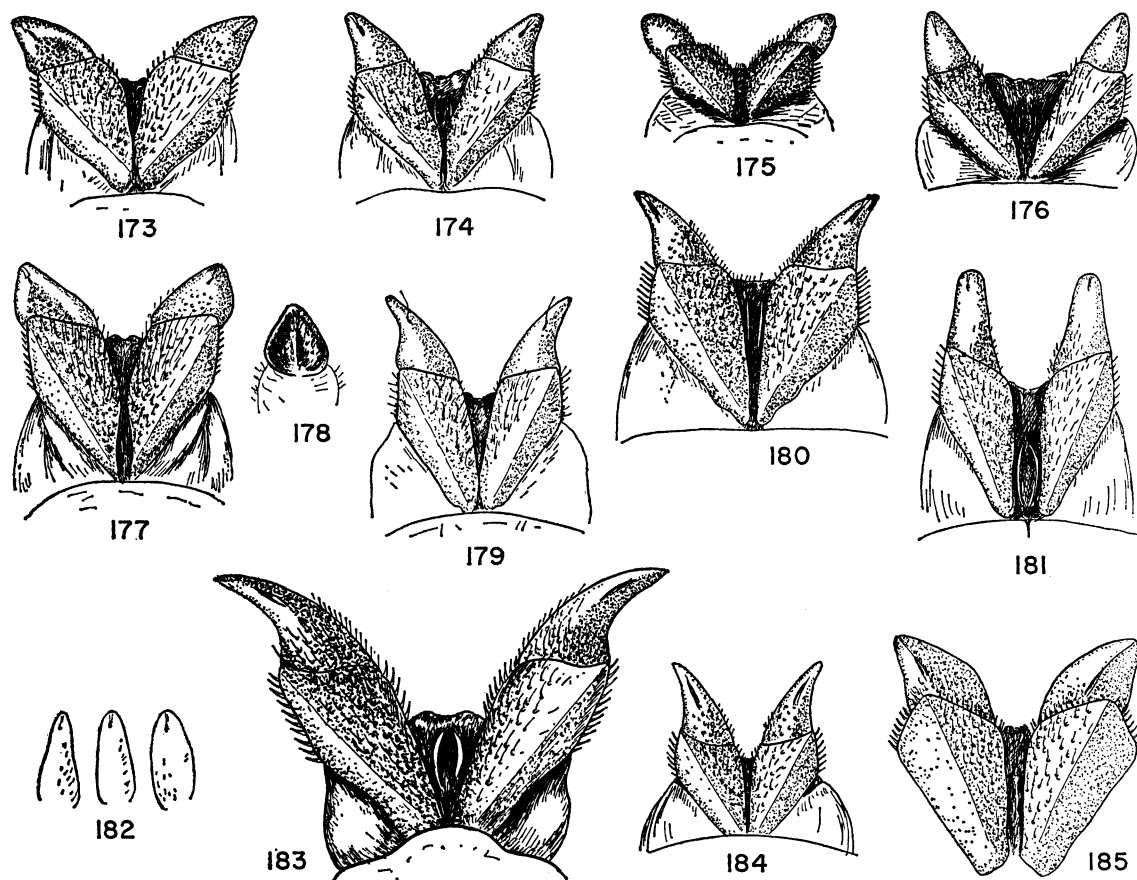
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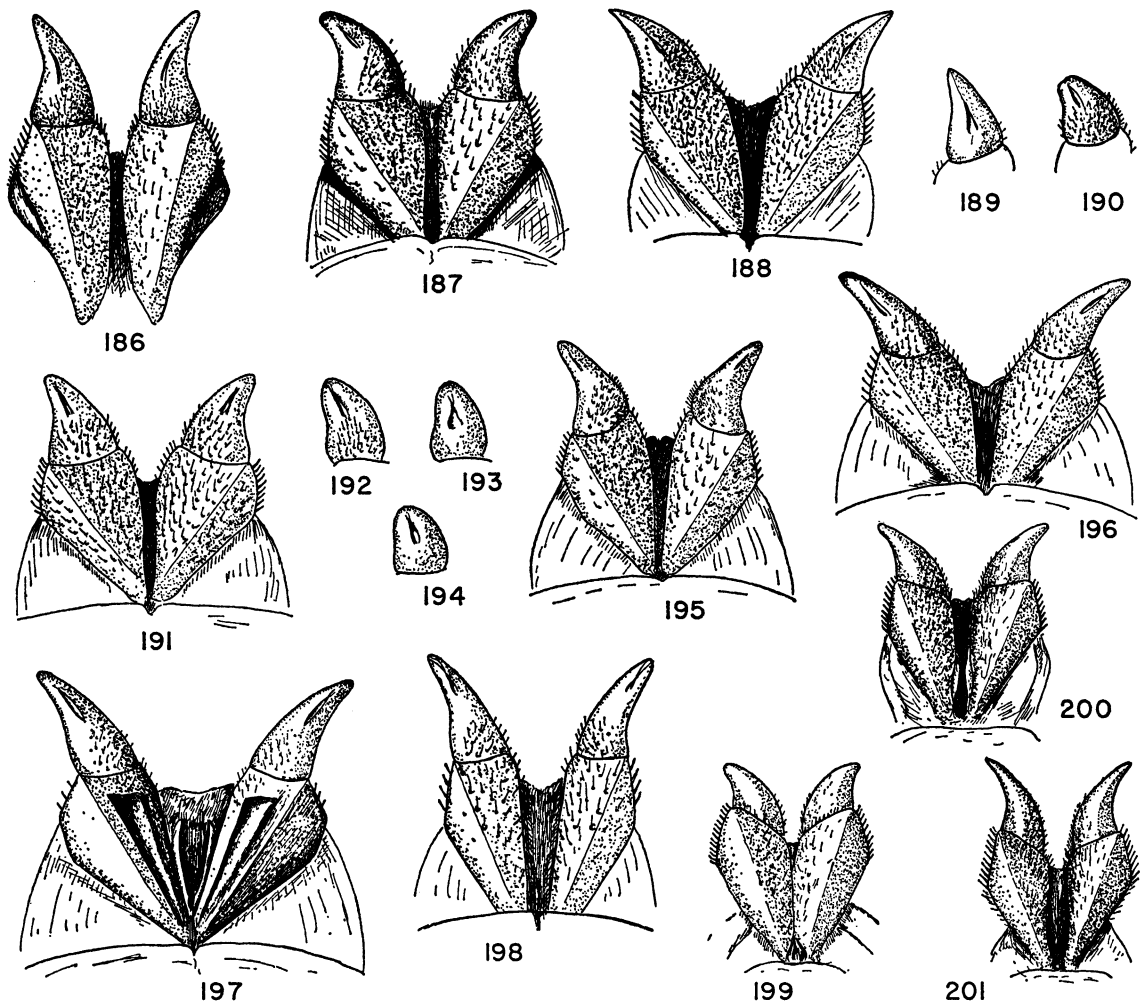
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