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INTRODUCTION

THE PRESENT REVIEW includes the species of the genus *Calosoma* to be found in South America, the Antilles, the Galápagos Islands, and Central America south of Mexico. I have provided keys for the identification of all subgenera and species, and all taxa are redescribed with the exception of those that were redescribed in the paper on the *Calosoma* of North America (Gidaspow, 1959). For a history of the genus and a discussion of characters, see my earlier report (Gidaspow, 1959).

Although 69 species of *Calosoma* (in 12 subgenera) are known from North America, only 16 occur in South America, of which 11 species are found on the mainland, two on the Galápagos Islands, and three in the West Indies. They belong to seven different subgenera, but most are in the subgenus *Castrida* (10 species). All the species of *Castrida*, except *sayi*, live in South America.

A few northern species of *Calosoma* penetrate to the West Indies and Central America, or even to northern South America. *Calosoma* (*Calodrepa*) *scrutator*, for instance, which is common in the United States, occurs in Guatemala and Venezuela, as does the Mexican species *Calosoma* (*Carabosoma*) *angulatum*. The range of *Calosoma* (*Camegonia*) *marginalis* extends from the southwestern United States to Mexico and Costa Rica, and *Calosoma* (*Calodrepa*) *aurocinctum*, a Mexican species, is found as far south as Nicaragua. But only one South American species, *alternans*, ranges northward as far as southern Mexico.

The species of *Calosoma* are well adapted to different climates, for the same species are found in the equatorial regions as in the cooler provinces of Argentina. Some species, such as *argentinense* and *vagans*, prefer cooler regions; the latter extends southward to the Strait of Magellan and also lives in the Andes where the winters are quite severe. Most species of the subgenus *Castrida* inhabit arid regions of brushwood and desert scrub.

Although the South American species of *Calosoma* were included in the works of Breuning (1927) and Jeannel (1940), the

localities given by these authors were limited and often referred to the country as a whole. In the last 22 years a great deal of additional information about the distribution of the species and the variations of local forms has become available.

A total of 1919 specimens has been examined, including the types in the Chaudoir and Dejean collections, except for *Calosoma bridgesi* Chaudoir which I could not locate during my visit to Paris.

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I am also grateful to Dr. Jerome G. Rozen, Jr., Chairman of the Department of Entomology, the American Museum of Natural History, and to Dr. Mont A. Cazier, former Chairman of the department, for their kind permission to study the collections of the Museum, and for aid that they have rendered.

I wish to express my thanks to the following people for permitting me to study the collections in their care: Dr. P. J. Darlington, Jr., of the Museum of Comparative Zoölogy of Harvard College; Mr. H. B. Leech of the California Academy of Sciences; Dr. S. H. Dybas of the Chicago Natural History Museum; Dr. G. E. Wallace of the Carnegie Museum in Pittsburgh, Pennsylvania; Dr. H. Freude of the Zoologische Sammlung des Bayerischen Staates in Munich, Germany; Dr. F. Lane of the Departamento de Zoologia in São Paulo, Brazil; Mr. J. W. McReynolds of Nevada, Missouri; Dr. Fernando de Zayas of Cuba; Dr. W. W. Gibson, Rockefeller Foundation Agricultural Program in Mexico; and Mr. R. Bénard of the Muséum National d'Histoire Naturelle, Paris. Dr. E. B. Britton of the British Museum (Natural History), London, sent me the description and the drawings of the type of *Calosoma galapageium*.

SYSTEMATIC ACCOUNTS

GENUS CALOSOMA WEBER

KEY TO THE SUBGENERA OF THE GENUS *Calosoma*

1. Metepisternum distinctly longer than wide (figs. 13, 15, 16, 19, 20, 21); wings well developed 2
- Metepisternum not longer than wide (figs. 12, 17); wings rudimentary or absent. 6
- 2(1). Middle tibiae in both sexes straight; pronotum with angular sides, without basal setae; color black or dark brown . . . 3
- Middle tibiae arcuate, especially in male; pronotum, although in some species strongly arcuate, not angular on sides; color usually different, but, if dark brown, then basal setae of pronotum present . 5
- 3(2). Elytra with deep striae and convex, scaly interstices; pronotum with pointed side angles. *Carabosoma* Géhin
- Elytra with shallow, punctate striae, or with sparse, large punctures connected by deep creases; interstices flat; side angles of pronotum rounded 4
- 4(3). Elytra at base with sparse, large punctures and deep creases; head also with large punctures; metatrochanter without seta *Camegonia* Lapouge
- Elytra at base scaly; head with fine, dense punctation; metatrochanter with seta *Camedula* Motschulsky
- 5(2). Pronotum without basal setae, metallic green or navy blue, with golden margin; elytra green or brownish, with green luster *Calodrepa* Motschulsky
- Pronotum with basal setae, or, if absent, then elytra either light brown or bluish green. . . *Castrida* Motschulsky (in part)
- 6(1). Metatrochanter with seta; elytra brown, without metallic luster, very smooth. Length, about 20 mm. *Neocalosoma* Breuning
- Metatrochanter without seta; elytra coppery or bronze, with metallic luster; usually smaller than 20 mm. 7
- 7(6). Metepisternum square (fig. 12), wingless; pronotum without setae; elytra coppery or yellow, with green tint *Microcalosoma* Breuning
- Metepisternum slightly longer than wide (figs. 14, 17, 18) wings rudimentary; pronotum with middle and often basal setae; elytra black or brown, with green or blue luster. . *Castrida* Motschulsky (in part)

SUBGENUS CARABOSOMA GÉHIN

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

KEY TO THE SUBSPECIES OF *Calosoma* (*Carabosoma*) *angulatum* CHEVROLAT

- Elytra with deep striae; interstices scaly from apex to base; smaller, length, 24–29 mm. South America . . . *angulatum angulicolle* Chaudoir
- Elytral interstices scaly at basal part, smoother toward apex; larger, length, 24–33 mm. Mexico. *angulatum angulatum* Chevrolat

***Calosoma* (*Carabosoma*) *angulatum angulicolle* Chaudoir**

Figure 1

Calosoma angulicolle CHAUDOIR, 1869, p. 377.
Type locality: Santa Marta, Colombia.

Although Jeannel (1940) considered *angulicolle* to be a distinct species, it is at most a subspecies of Mexican *angulatum*. There is some difference in size (average length of *angulicolle*, 25.7 mm.; range, 24–27 mm.; average length of *angulatum*, 27.4 mm.; range, 24–33 mm.). Further, the elytra of *angulicolle* are normally more scaly and in some specimens have deeper striae.

The difference in the form of pronotum cited by Jeannel (1940, pp. 200, 201, 203, figs. 160, 164) is an infrasubspecific variation. There is also no difference in the punctuation of the head or in the blue-green luster on the elytral margin. The majority of fresh South American specimens (*angulicolle*) have a shining luster on the elytral margin that is lost on worn beetles, as is true of the Mexican forms.

MATERIAL EXAMINED: Thirty specimens of *angulicolle* and 450 of *angulatum*.

SUBGENUS CAMEGONIA LAPOUGE

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

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

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

Calosoma (*Carabosoma*) *lecontei* CSIKI, 1927, p. 21; new name for *lugubre* LeConte, 1835, p. 400, preoccupied by *lugubre* Motschulsky. Type locality: Braunfels, Texas.

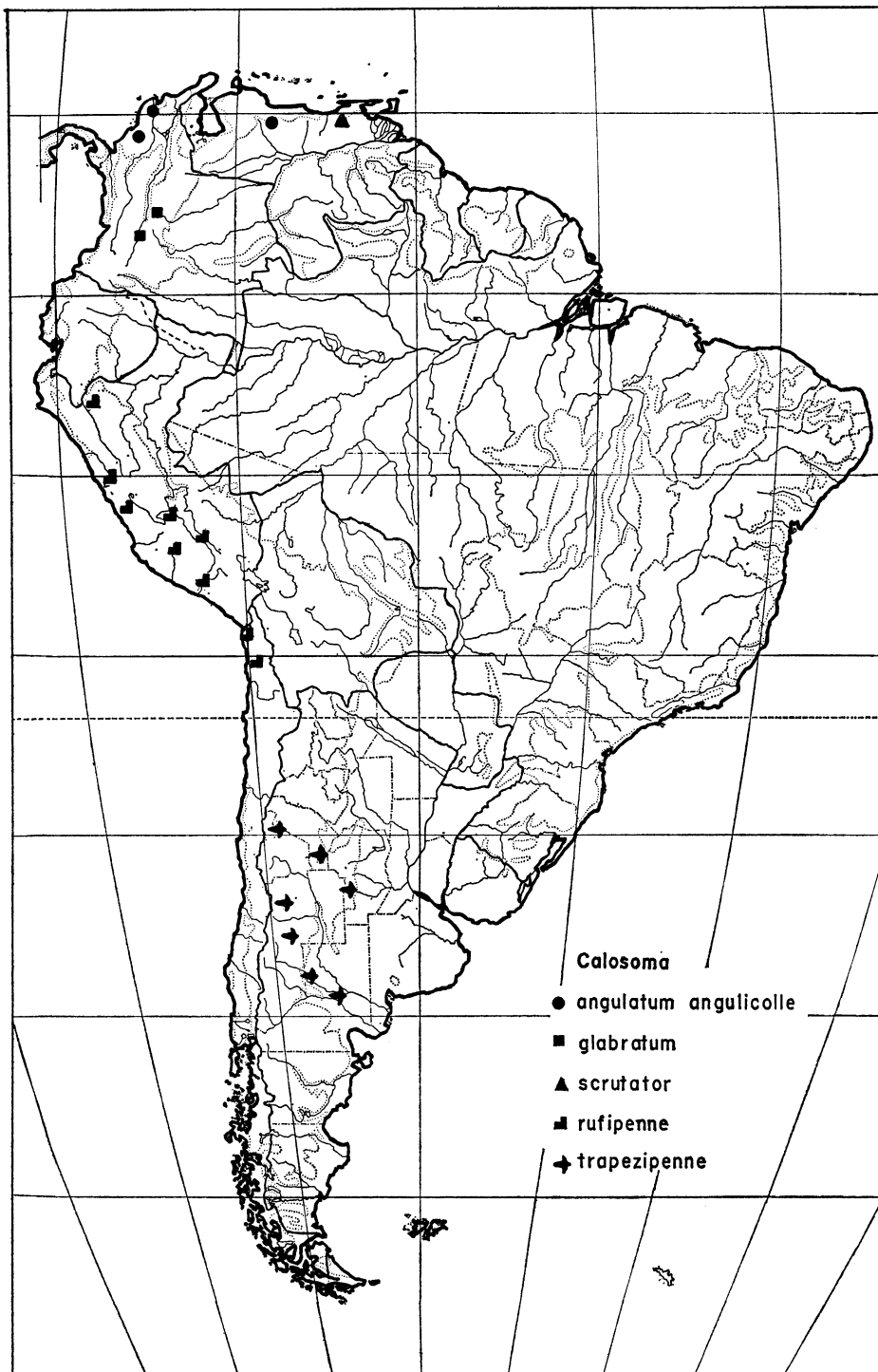


FIG. 1. Distribution of *Calosoma* (*Carabosoma*) *angulatum angulicolle* Chaudoir, *C. (Camedula) glabratum* Dejean, *C. (Calodrepa) scrutator* Fabricius, *C. (Castrida) rufipenne* Dejean, and *C. (Castrida) trapezipenne* Chaudoir.

This is primarily a North American species of the western and southwestern United States, but it also occurs in Mexico and, occasionally, in Costa Rica. From the last-named country I have seen two specimens.

SUBGENUS **CAMEDULA** MOTSCHULSKY

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

Calosoma (Camedula) glabratum Dejean

Figures 1, 56

Calosoma glabratum DEJEAN, 1831, p. 565. Type locality: Colombia.

Carabosoma bolivianum GÉHIN, 1885, p. 65. Type locality: Bolivia.

DESCRIPTION: Resembling *peregrinator* (United States and Mexico), but smaller and more brownish. Head moderately and finely punctate and wrinkled, in some specimens only near eyes; labrum wrinkled and with small notch; last segment of maxillary palpi shorter and wider than preceding one; mandibles rugose and punctate in creases; eyes feebly projecting, with one seta near each; third segment of antennae compressed, second and base of fourth more feebly so; beginning with fifth segment, antennae pubescent, with indistinct glabrous spots on fifth and sixth segments, in some specimens also on following ones; tooth of mentum pointed, without pore punctures.

Pronotum twice as wide as long, angulated, but with rounded side angles as in *peregrinator*; lateral margin narrow from apex to base and with middle setae only, basal ones absent; hind angles small, pointed, hardly projecting beyond basal line; disk very finely wrinkled, more so at base and sides.

Elytra with almost parallel sides, distinct humeral angles and serrated margin near them; striae fine, with minute punctures; interstices flat; foveae on fourth, eighth, and twelfth interstices not present in all specimens, usually shallow and small.

Ventral side dark brown; proepisternum smooth; metepisternum, first, second, and part of third abdominal segments with large, sparse punctures, which in some specimens are present also on proepisternum and mesepisternum; fourth and fifth abdominal segments finely wrinkled and punctate, sixth one more densely punctate in females, and

with large punctures on the apex, bearing short hair as in *peregrinator*, but not on entire segment as in that species. Penis not so wide as that of *peregrinator*, but with same broadly rounded tip; hook on inner armature with long neck (fig. 56); leaf-like process of female genitalia not so pointed as that of *peregrinator*. Metatrochanter in both sexes with rounded tip and seta; anterior tarsi of male dilated, and all three segments with dense brush underneath; all tibiae straight, as usual in subgenus *Camedula*.

Length, 18.5 mm.; width, 8–10.5 mm.

DISTRIBUTION: Northern South America, around Bogota and Pandi in Colombia, on grassland and cultivated fields (fig. 1). According to Breuning (1927) and Jeannel (1940), also in Panama, Peru, and Bolivia.

Breuning (1927) regarded *peregrinator* as a subspecies of *glabratum*. Jeannel (1940) treated them as different species, which I believe they are.

Géhin's *bolivianum*, treated by Breuning (1927) as another subspecies of *glabratum*, is apparently a synonym, as stated by Jeannel (1940). The small size of *bolivianum* (11 mm.) is considered by Jeannel to be a misprint.

MATERIAL EXAMINED: Thirty-four specimens.

SUBGENUS **CALODREPA** MOTSCHULSKY

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

KEY TO THE SPECIES OF THE SUBGENUS
Calodrepa MOTSCHULSKY

1. Elytral margin of same color as elytra, green or light brown, with green luster; tibiae and tarsi brown. Length, 21–28 mm. Greater Antilles (Cuba, Haiti, and Dominican Republic), and the United States *splendidum* Dejean
Elytral margin purple or golden green; tibiae and tarsi reddish brown or dark brown. 2
- 2(1). Pronotum metallic green, in some specimens with slightly lighter margin; femur bluish green. Length, 22–30 mm. Mexico, Nicaragua. *aurocinctum* Chaudoir
Pronotum navy blue or black, with purple or golden green margin; femur reddish brown, in a few darker, with blue or purple luster. Length, 25–35 mm. United States, Mexico, Guatemala, Venezuela *scrutator* Fabricius

Calosoma (Calodrepa) scrutator Fabricius

Figure 1

Calosoma scrutator FABRICIUS, 1775, p. 239.
Type locality: Virginia.

This species is very common in the United States, but it is rare in Mexico, Central America, and northern South America.

RECORDS (FIG. 1): *Guatemala*: Amatitlan; Mauricio; Zaculeu near Huehuetenango. *Venezuela*: Cumana. (For localities in Mexico and the United States, see Gidaspow, 1959.)

The three males and two females from South America that I have examined are very much like typical *scrutator* of the United States, but one male from Guatemala has dark brown, not reddish, legs, although with the same blue luster as in the typical forms.

Calosoma (Calodrepa) splendidum Dejean

Calosoma splendidum DEJEAN, 1831, p. 558.
Type locality: Santo Domingo, Dominican Republic.

This species is from the Greater Antilles and southeastern United States.

RECORDS: *Cuba*: Guantanamo; Jobabo. *Dominican Republic*: Santo Domingo; Santiago. *United States*: Florida: Chokoloskee; Key West. Georgia: Clarke County.

MATERIAL EXAMINED: Twenty specimens.

Calosoma (Calodrepa) aurocinctum Chaudoir

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

This primarily Mexican species extends as far as Nicaragua, and the specimens that I have examined from there are not different from those from Mexico.

MATERIAL EXAMINED: Sixty-six specimens.

SUBGENUS **NEOCALOSOMA** BREUNING

Neocalosoma BREUNING, 1927, p. 146; 1928, p. 121. Type: *Calosoma bridgesi* Chaudoir.

The subgenus *Neocalosoma* was described by Breuning for a single species, *bridgesi* Chaudoir, which resembles *Calosoma laeve* of Mexico and, like it, is apterous.

Jeannel (1940) placed *Neocalosoma* as a subgenus of *Castrida* which he treated as a genus. I believe that *Neocalosoma* has more in common with the subgenera *Blaptosoma*,

Microcalosoma, and *Carabomimus*, and it would be better to leave it and *Castrida* as separate subgenera of the genus *Calosoma*.

The main characters of the subgenus *Neocalosoma* are presented in the following description of its single species.

Calosoma (Neocalosoma) bridgesi Chaudoir

Calosoma bridgesi CHAUDOIR, 1869, p. 377. Type locality: Tucuman, Argentina.

I have not seen the type, but Mrs. Patricia Vaurie examined the apparent cotype in the Muséum National d'Histoire Naturelle in Paris and kindly sent me her notes and drawings. There were four specimens: one male with the label "Amer. Intér. (Musaeo A. Salle 1897)," one female from "S. Amer. (Musaeo Fd. Brown)," another from "Chile (Musaeo Mniszech)," and the third from "Toluca, Mexico (collection J. B. Géhin, 1869, An. Soc. Fr. 377)." The last-named is apparently mislabeled, because *bridgesi* does not occur in Mexico.

DESCRIPTION: The four specimens from Bolivia¹ that I have examined are black, with reddish brown elytra. Head stout as in *laeve*, sparsely and finely wrinkled and often with minute punctures. Pronotum as wide as long, with side setae in middle of lateral margin and basal ones, which are apparently not always present, near hind angles; hind angles not larger than those of *laeve*, rounded, hardly or not at all projecting beyond basal line; disk smooth, slightly wrinkled, more so on sides and base. Elytra oval, smooth, hardly wider than pronotum, rather convex, shorter than in *laeve*, with arcuate, not parallel sides, and wider toward apex. Metepisternum not longer than wide, as usual in apterous species; meta-trochanter with seta; middle tibiae arcuate, especially in male. Penis more slender than in *laeve*, with a thinner, slightly bent tip. Female genitalia of the usual *Calosoma* type.

LENGTH, 19–20 mm.; width, 8–9 mm.

DISTRIBUTION: This rare species is apparently localized in the mountains in northern Argentina, Chile, and Bolivia.

RECORDS: *Argentina*: Tucuman. *Bolivia*: Cochabamba, Tiraque, at an altitude of 3200 meters. *Chile*.

¹ This rare species was kindly sent to me by Mr. John W. McReynolds, whose collection of *Calosoma* is one of the best I had the opportunity to examine.

Although this species is similar to *laeve*, it differs by having arcuate middle tibiae and slightly shorter elytra, which are wider toward the apex. It is also similar to *Castrida vagans*, but the latter has well-developed wings and consequently longer metepisternum, while *bridgesi* is apterous.

SUBGENUS **MICROCALOSOMA** BREUNING

Microcalosoma BREUNING, 1927, p. 146; 1928, p. 123. Type: *Calosoma linelli* Mutchler.

This subgenus was proposed by Breuning for one species, *linelli*, from the Galápagos Islands. Later Jennel (1940), who recognized *Microcalosoma* as a subgenus of the genus *Castrida*, added *galapageium* to the same subgenus. Although both species live on the Galápagos Islands and have a few characters in common, they are different and cannot belong to the same subgenus. *Calosoma galapageium* usually has well-developed wings and basal setae on the pronotum and is spread over the entire archipelago, while *linelli* is apterous, has no setae on the pronotum, and is localized on Chatham Island. Therefore it seems better to leave *Castrida* and *Microcalosoma* as separate subgenera, to place *galapageium* in the subgenus *Castrida* together with the other winged species, and to leave *linelli* in the subgenus *Microcalosoma*, as was done by Breuning (1927).

The main characters of *Microcalosoma* are given under the description of the species.

***Calosoma (Microcalosoma) linelli* Mutchler**

Figures 8, 12, 33, 36, 57, 58, 84

Calosoma linelli MUTCHLER, 1925, p. 222; new name for *Calosoma galapageium* Linell, 1899, p. 250, preoccupied by *galapageium* Hope. Type locality: Catham Island, Galápagos.

DESCRIPTION: One of the smallest species of *Calosoma*, about 12–13 mm. in length. Light brown, elytra cupreous, with green luster, antennae and legs much lighter.

Head smooth and shining, with a few wrinkles near eyes; eyes hardly projecting, with one seta near each; occiput swollen; labrum almost bifurcate; mandibles strigose and with sparse punctures; last segment of maxillary palpi not shorter, but distinctly wider than preceding one (fig. 36); tooth of mentum pointed and without pore punctures; antennae comparatively short; basal part of

first segment and basal part of fourth one distinctly compressed, beginning from fifth segment antennae uniformly pubescent.

Pronotum narrow, not more than one and a half times as wide as long, narrowed posteriorly; hind angles obtuse, extending backward; basal line straight; lateral margin thin from apex to base and without either basal or middle setae; apical marginal bead distinct; disk very smooth, shining, without punctation, but finely wrinkled.

Elytra round-oval, slightly convex; humeral angles distinct; elytral margin even; striae regular, punctate; interstices of unequal width, the fourth, eighth, and twelfth bearing foveae, being wider and more elevated than adjacent ones (chain-like); foveae shallow, with green luster and a little granule inside; all interstices smooth or slightly wrinkled.

Ventral side extremely smooth, a few shallow punctures may be present on metepisternum as well as on first and second abdominal segments; following segments finely wrinkled, last one with four setae on apex, without additional ones in second row; fourth and fifth segments with two setae each, first three abdominal segments apparently without setae; metepisternum as long as wide, as usual in wingless species (fig. 12); prosternal process flat, with round apex; legs comparatively long; metatrochanter without setae, and in both sexes with rounded tip; femur smooth, with short, sparse setae; anterior tibiae without longitudinal furrows, on tip with short spines, as if they were broken; middle tibiae arcuate, more so in male, the latter with a brush of red hair on inner, upper side of middle tibiae; hind tibiae straight; anterior tarsi smooth and shining, in male dilated and bearing a dense brush on ventral side of three segments; depression on dorsal side of second segment present; traces of depression appearing on third segment; posterior tarsi slender, second segment more than three times as long as wide (fig. 33). Penis with peculiar tip, resembling a fish tail, inner armature slender, hook long (figs. 57, 58). Gonapophyses also slender, leaf-like process slim and pointed, with elongated furrow containing two tiny setae; basal sclerites of genitalia convex, with large, sparse punctures bearing setae (fig. 84).

Length, 12–13 mm.; width, 5.5–6 mm.

DISTRIBUTION: Localized on Chatham Island, Galápagos.

MATERIAL EXAMINED: Three specimens.

SUBGENUS *CASTRIDA* MOTSCHULSKY

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

DESCRIPTION: Body oblong; elytra usually convex, with distinct humeral angles, deep, regular striae, and strongly or moderately convex interstices. Mostly shining species, with reddish, copper, or metallic green luster, some species brown or black, and, like *vagans*, without metallic luster.

Front of head punctate and wrinkled, in some species, such as *argentinense* and *abbreviatum*, quite densely so; labrum almost bifurcate or at least deeply curved; mandibles rough, rugose, and punctate; antennae normally long, reaching beyond humeri, with third segment distinctly compressed, second segment and base of fourth segment slightly so; last segment of maxillary palpi either of same length as preceding one and only slightly wider, as in *alternans*, *sayi*, and *fulgens*, or shorter and distinctly wider than preceding one, as in *vagans*, *rufipenne*, and other species. Unfortunately this character is not distinct in all cases, especially in *argentinense* and *retusum*; tooth of mentum usually short and pointed, in some specimens blunt, but this is an infraspecific variation; eyes more or less prominent, with one seta near each.

Pronotum wide, mostly two or more times as wide as long, widest part in middle, rarely being narrowed posteriorly; basal and middle setae present (but in *rufipenne* basal setae absent, as in many individuals of *galapageium*); sides usually slightly arcuate, in some specimens straighter posteriorly; hind angles either rounded, extending backward, as in *retusum*, or pointed, almost obliterated, as in *argentinense*, *abbreviatum*, and some others; basal dimples deep, with coarse punctures and heavy wrinkles; disk seldom smooth as in *vagans*, usually punctate and wrinkled, at least slightly, as in *retusum*, or strongly so as in *argentinense* and *abbreviatum*.

Elytra oblong, humeri distinct, margin near them serrated or even; striae regular, mostly deep, interstices convex, at least

slightly, and in some species, as in *alternans* and some individuals of *sayi*, of unequal width; most species having scaly interstices, with transverse wrinkles connecting punctures of adjacent striae; foveae on fourth, eighth, and twelfth interstices present in all individuals often large and brilliant, and with granule inside.

Ventral side brown or black, in many with metallic luster, more or less densely punctate on sides of thorax and abdomen; prosternal process either short and wide, with strongly elevated sides, as in *trapezipenne* (fig. 24), or more slender, with less elevated sides, as in most other species (figs. 25–30). Metepisternum longer than wide and wings well developed. However, in some forms of *galapageium*, such as *darwinia*, metepisternum much shorter, only slightly longer than wide (fig. 14), and, in forms from James Island, quite short, almost square, with consequently reduced wings (figs. 17, 18). Legs normally long, metatrochanter without seta, except in *trapezipenne* and some specimens of *galapageium*; in females metatrochanter rounded or slightly pointed on tip, in males pointed, *alternans*, *sayi*, and *fulgens* noticeable for their long, arcuate, and pointed metatrochanter, *abbreviatum* noticeable for truncate one (figs. 40–52); metatrochanter of *vagans* rounded in both sexes (fig. 42); middle tibiae strongly arcuate, more so in male, tip of middle tibiae in males with patch of red hair on inner, upper side. This patch may be very small, just between two spurs (as in *alternans*, *sayi*, and *fulgens*), or longer, like a brush (as in *trapezipenne*, *vagans*, *retusum*, and *argentinense*, and partly in *abbreviatum* and *galapageium*), or (as in *rufipenne*) like a fringe of red hair on the whole upper part of the tibiae, becoming denser and wider toward the apex. Some males of *abbreviatum* also have a fringe of red hair, almost as long as in *rufipenne*. Rarely, males of *Castrida* lack the patch, as do females, or they may have patches on middle and hind tibiae; hind tibiae almost straight. Usually tibiae and tarsi finely, sparsely punctate in addition to rows of punctures with setae, present in all *Calosoma*. Second segment of hind tarsi either three times as long as wide, and usually longer than one-half of first one, as in *sayi*, *alternans*, *fulgens*, and *galapageium*, or only twice, seldom

two and a half times, as long as wide, as in *vagans*, *retusum*, and *argentinese*. Front tarsi of male with three segments dilated and bearing a dense brush on ventral side, except in *sayi* in which first segment has incomplete brush, and only second one fully covered underneath. Dorsal side of second segment with more or less distinct depression, absent in *abbreviatum* and *rufipenne*. Last abdominal segment with up to eight setae on apex and no additional ones in second row, as in many other subgenera (*Chrysostigma*, *Carabomimus*, and some others). Third, fourth, and fifth abdominal segments with two to four setae each. Penis stout, with straight tip, as in *retusum* and *vagans* (figs. 78, 80), or more slender, with slightly bent tip, as in *galapageium*, *sayi*, and *alternans* (figs. 62-74, 77), or, as in *fulgens*, with strongly bent tip (fig. 75); inner armature in all specimens ending in hook. Female genitalia not differing much among species; leaf-like process in *sayi*, *alternans*, and *fulgens* more rounded, more spoon-shaped, than in other species, and often with rounded, less elongated furrow (figs. 84-88).

All species of this subgenus are relatively large, about 22 to 28 mm.; a few are 30 mm.; only *galapageium* is smaller, 16 to 22 mm.

The subgenus *Castrida* has many characters in common with the subgenera *Calosoma* and *Calodrepa*; it differs from them, as well as from other subgenera of the genus *Calosoma*, in the presence of the basal setae on the pronotum, the absence of a seta on the metatrochanter, and in having a depression on the second segment of the front tarsi in the male. The species of the subgenus *Calosoma* are European and Asiatic, except *frigidum*, which lives in the United States. On the contrary the subgenus *Calodrepa* is distributed throughout the North American continent, with *splendidum* found also on Haiti and Cuba, and *scrutator* in northern South America. The species of the subgenus *Castrida* are South American, except *sayi*, which inhabits North and Central America and the Greater Antilles.

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

1. Metepisternum large and broad, only a little longer than wide (fig. 13); prosternal process wide, with strongly elevated

- sides (fig. 24); mandibles with deep, transverse creases (fig. 22); elytra hardly convex, usually wider toward apex; color coppery red, with brilliant green luster. length, 17-23 mm. Argentina
 *trapezipenne* Chaudoir
 Metepisternum distinctly longer than wide, except in some small specimens of *galapageium* (figs. 15, 16, 19-21); prosternal process more elongated, with less elevated sides (figs. 25-30); mandibles usually with longitudinal striae or creases (fig. 23) 2
 2(1). Elytra light brown, with green margin; head and pronotum black, with blue or green luster; second segment of hind tarsi two and a half or three times as long as wide (fig. 31); last segment of maxillary palpi distinctly shorter and wider than preceding one (fig. 37). Length, 22-24 mm. Peru, Chile
 *rufipenne* Dejean
 Elytra of different color (reddish copper, bronze, brilliant green, or dark brown, without metallic luster) 3
 3(2). Elytra, often head and pronotum, with bluish green luster; last segment of maxillary palpi shorter and distinctly wider than preceding one; second segment of hind tarsi three times as long as wide. length, 16-22 mm. Galápagos Islands
 *galapageium* Hope
 Elytra with coppery, golden, or green luster, or brown without metallic luster; last segment of maxillary palpi almost as long as, and scarcely wider than, preceding one, or if short and wide, as in *galapageium*, then second segment of hind tarsi is stouter, not more than twice as long as wide 4
 4(3). Last segment of maxillary palpi almost as long as, and hardly wider than, preceding one (fig. 39); second segment of hind tarsi three times as long as wide (fig. 32); metatrochanter of male strongly arcuate and pointed (fig. 43) 5
 Last segment of maxillary palpi usually shorter and distinctly wider than preceding one (fig. 38); second segment of hind tarsi usually not more than twice, seldom two and a half times, as long as wide (figs. 34, 35); metatrochanter of male not arcuate, with rounded or slightly pointed tip (figs. 45, 47, 49-51) 8
 5(4). All elytral interstices of equal width, and barely convex or flat, except the tenth which may be narrower than adjacent

- ones; color brilliant coppery red, with green luster; tip of penis strongly bent (fig. 75). Length, 24–26 mm. Colombia, Ecuador, Peru, Bolivia, Uruguay *fulgens* Chaudoir
- Second, sixth, and tenth elytral interstices narrower than adjacent ones, strongly convex; if all interstices of equal width, then color dark and dull; tip of penis straight (fig. 77). 6
- 6(5). Second, sixth, and tenth elytral interstices either of equal width or slightly narrower than adjacent ones; hind angles of pronotum obtuse; anterior tarsi of male with two segments bearing dense brush on ventral side. *sayi* Dejean
- Second, sixth, and tenth elytral interstices much narrower than adjacent ones; fourth, eighth, and twelfth interstices bearing foveae often narrower; anterior tarsi of male with three segments bearing dense brush on ventral side 7
- 7(6). Darker beetles, less shining; fourth, eighth, and twelfth interstices bearing foveae, usually narrower than adjacent ones. Length, 23–27 mm. Colombia, Ecuador, Venezuela, northern Brazil, Panama, Mexico, the Lesser Antilles. *alternans alternans* Fabricius
- Shining beetles with green luster on head and pronotum and coppery elytra; fourth, eighth, and twelfth interstices, bearing foveae, of equal width, in a few narrower than adjacent ones. Length, 24–30 mm. Brazil, Argentina, Paraguay, Bolivia. *alternans granulatum* Perty
- 8(4). Dark brown, without metallic luster; elytral interstices flat or slightly convex, with fine, transverse wrinkles. Length, 20–25 mm. Chile, Argentina *vagans* Dejean
- Shining beetles, with green or reddish luster; elytral interstices convex, with deep, transverse wrinkles (scaly) 9
- 9(8). Pronotum with slightly arcuate sides and rounded hind angles extending backward; disk slightly wrinkled, coarsely punctate at base; head with sparse punctures (fig. 10); elytral striae with distinct punctures; brilliant green or coppery, with metallic green luster. Length, 25–30 mm. Argentina, Uruguay, Brazil *retusum* Fabricius
- Pronotum with small, mostly pointed hind angles, extending backward slightly if at all; punctation on head and pronotum dense (fig. 11); punctures on elytral striae inconspicuous; beetles less shining,

- dustier, with reddish bronze or green luster 10
- 10(9). Metatrochanter truncate (figs. 49, 50, 51); color usually green; second segment of anterior tarsi in male without depression on dorsal side; tip of penis short and rounded, not arcuate (fig. 82). Length, 22–25 mm. Colombia, Ecuador, Peru, Bolivia. *abbreviatum* Chaudoir
- Metatrochanter with rounded tip (fig. 45); color reddish bronze or coppery, in only a few with green luster; depression on dorsal side of anterior tarsi; tip of penis thin, long, and slightly arcuate (fig. 83). Length, 20–25 mm. Argentina, Paraguay, Bolivia, Brazil. *argentinense* Csiki

Calosoma (Castrida) trapezipenne Chaudoir

Figures 1, 9, 13, 22, 24, 40, 41, 53–55, 59, 60, 86

Calosoma trapezipenne CHAUDOIR, 1869, p. 369. Type locality: Mendoza, Argentina.

DESCRIPTION: Coppery red, with green luster. Body shorter and flatter than that of *argentinense* and *retusum* which resemble *trapezipenne*; elytra less convex and wider toward apex than those in other species of *Castrida*.

Head and pronotum finely, densely punctate and wrinkled; eyes slightly projecting, less so than in *argentinense*; mandibles with deep, transverse creases (fig. 22), not with longitudinal striae or creases, as usual in the subgenus *Castrida* and other subgenera of *Calosoma* (fig. 23); labrum almost bifurcate, tooth of mentum usually blunt, although in some examples pointed (figs. 53–55); antennae as in other species of *Castrida*.

Pronotum twice or more than twice as wide as long, appearing very broad because of comparatively small head; widest place in most cases close to middle, not necessarily anterior to it, as often described in the literature (Breuning, 1927); hind angles obtuse, extending backward, distinctly more prominent than those of *argentinense* or *abbreviatum*, and more pointed than those of *retusum*; lateral margin narrow from apex to base and bearing two setae, basal and middle ones; disk finely, densely punctate and wrinkled (fig. 9).

Elytra hardly convex and usually wider toward apex; humeral angles distinct, with even margin near them; striae regular and deep, formed by imprinted lines and incon-

spicuous punctures, as in *argentinense* and *abbreviatum*; interstices of equal width, slightly convex and scaly from apex to base; foveae large, but shallow, golden green or reddish copper, lighter than elytra.

Ventral side dark brown, with metallic luster; prosternal process broad, toward tip with elevated margin (fig. 24); however, some specimens from Catamarca have less elevated side margin of prosternal process, although not so flat as in other species of *Castrida*. Proepisternum and mesepisternum smooth, metepisternum large and wide, with sparse punctures at base (fig. 13); abdominal segments finely punctate and wrinkled, mostly on sides, last segment entirely so, with four to eight setae on apex; third, fourth, and fifth segments bearing two setae each; metatrochanter in both sexes barely pointed, and usually with seta, yet 13 per cent of the beetles examined lacked it (figs. 40, 41); middle tibiae of male with brush of red hair on tip; anterior tarsi of male strongly dilated, bearing dense brush on ventral side, second segment with depression on dorsal side; second segment of hind tarsi hardly more than twice as long as wide. Penis more or less stout, with short, almost straight tip, hook of inner armature short (figs. 59, 60); female genitalia of usual type, tip of leaf-like process obtuse or slightly pointed (fig. 86).

Length, 17–23 mm.; width, 9–12 mm.

DISTRIBUTION: This species is not common; it is found on the western plateau of Argentina, on the elevations at San Juan and Mendoza, in the xerophyte forests of the Sierra de Cordoba, and on the bare hills of the Rio Negro around dry bush and desert scrub. According to Jeannel (1940), it extends south to Patagonia.

RECORDS (FIG. 1): *Argentina:* Catamarca: Valle de Santa Maria. San Juan. Cordoba. Mendoza. Rio Negro: Cipolletti; Lamarque.

Calosoma (Castrida) trapezipenne is similar to *argentinense* but differs from it, as well as from other species of *Castrida*, in the form of the body, with its small head and wide pronotum, in the slightly convex elytra, which is wider toward the apex, the large and broad metepisternum, and the wider prosternal process with elevated sides. It resembles *galapageium* by having a seta on the metatrochanter, but differs from it by having basal setae on the pronotum.

Jeannel (1940) left *trapezipenne* in Lapouge's subgenus *Catastriga* of the genus *Castrida*. I believe that *Catastriga* and *Castrida* are synonyms.

In Csiki's (1927) and Blackwelder's (1944) catalogues, *trapezipenne* is listed as a variety of *granulatum*. This is an error; *trapezipenne* is a full species and is recognized as such by Breuning (1927), Jeannel (1940), and other entomologists.

MATERIAL EXAMINED: Thirty specimens.

***Calosoma (Castrida) rufipenne* Dejean**

Figures 1, 31, 37, 61, 87

Calosoma rufipenne DEJEAN, 1831, p. 566. Type locality: San Lorenzo, Peru.

DESCRIPTION: Head and pronotum black, with green or blue luster, elytra light brown or yellowish brown, with golden green margin.

Head moderately densely and not very finely punctate, also deeply wrinkled at front; tooth of mentum small, blunt, in only a few cases distinctly pointed; last segment of maxillary palpi shorter and much stouter than preceding one (fig. 37).

Pronotum with arcuate sides, straighter posteriorly; lateral margin narrow and with middle setae only; hind angles small, pointed, extending a little beyond basal line; disk finely wrinkled and very finely punctate, more coarsely toward base.

Elytral margin near humeri slightly serrated; striae with fine, inconspicuous punctures connected by thin lines; interstices hardly convex, not scaly, but with fine, transverse, and irregular wrinkles; foveae shallow, not distinct in all specimens, in some purple or bluish.

Ventral side brown, darker than elytra, and with faint blue luster; proepisternum, mesepisternum, and metepisternum very smooth, the latter in a few individuals with a few punctures and wrinkles; first abdominal segment with fine, sparse punctures on sides; following segments finely wrinkled, the last one entirely so; metatrochanter in both sexes with round tip, mostly with seta (57% of the beetles examined); middle tibiae slightly arcuate, in male with long fringe of red hair, almost as long as half of middle tibiae; second segment of hind tarsi two and a half to three times as long as wide (fig. 31); anterior tarsi

of male with three segments dilated and bearing dense brush on ventral side; second segment without depression on dorsal side, while most of the species of this subgenus have it. Penis stouter than that of *sayi*, but more slender than that of *retusum*, hook of inner armature also shorter (fig. 61); leaf-like process of female genitalia of usual form, not spoon-shaped like that of *sayi*, although tip more rounded than usual (fig. 87).

Length, 22–24 mm.; width, 8.5–9.5 mm.

DISTRIBUTION: This species is not common. It is found in Peru and northern Chile, from the cultivated fields of Piura and Lima provinces in Peru, through the pampas on the elevations of Arequipa and Mollendo, and, following the pampas, into Tarapaca in Chile.

RECORDS (FIG. 1): *Peru:* Piura: Quiras River. Ancachs: Huacho. Lima: City of Lima. Cuzco: River Puacartambo. Arequipa: Arequipa; Mollendo. *Chile:* Tacna; Azapa River near Arica. Tarapaca: Pintados.

This species is readily distinguished by the light brown elytra, the black head and pronotum, with green luster, and by the absence of the basal setae on the pronotum. About half of the specimens of *galapageium* also lack setae.

As is the case with other species of *Calosoma* of South America, *rufipenne* has been shifted from one subgenus to another. Breuning (1927) placed it in the subgenus *Camedula* Motschulsky. Jeannel (1940) described for it a new subgenus, *Caludemma* of the genus *Castrida*. I do not think it is necessary to describe a new subgenus for this single species, because *rufipenne* fits fairly well in the subgenus *Castrida*, much better than in the subgenus *Camedula*, where it was placed by Breuning.

MATERIAL EXAMINED: Thirty-nine specimens.

***Calosoma (Castrida) galapageium* Hope**

Figures 2, 14–19, 25, 62–74

Calosoma galapageium HOPE, 1837, p. 130. Type locality: Galápagos Islands.

Calosoma granatense GÉHIN, 1885, p. 59. Type locality: South America (Colombia?).

Calosoma galapagoum? "Hope," LINELL, 1889, p. 191.

Calosoma howardi LINELL, 1899, p. 251. Type locality: James Island, Galápagos.

Calosoma darwinia VAN DYKE, 1953, p. 10. Type locality: Villamil, Albemarle Island, Galápagos.

DESCRIPTION: Black or dark brown, with bluish green luster.

Front of head sparsely, finely punctate and finely wrinkled, in a few cases almost smooth; last segment of maxillary palpi shorter and wider than preceding one.

Pronotum slightly narrowed posteriorly, one and a half times or a little less than twice as wide as long, smooth or finely wrinkled, with sparse punctures at base; hind angles small, pointed, slightly projecting beyond basal line; lateral margin thin from apex to base, and in many cases lacking setae. Among 288 specimens examined from the Galápagos, 50 per cent had no basal setae; they were collected mostly on Chatham and Tower Islands, although a few specimens came from Charles Island. Most of the examples from Albemarle, Indefatigable, James, and the other islands had the middle and basal setae.

Elytra with distinct humeral angles, more or less parallel sides, only in a few wider toward apex; elytral margin even, without slightest trace of serration; striae regular, punctate; interstices convex, with fine, transverse wrinkles but not scaly, fourth, eighth, and twelfth interstices broken into chains by shallow, golden green, or coppery foveae.

Ventral side brown, with bluish luster, proepisternum and mesepisternum smooth, metepisternum and first abdominal segment with large, sparse punctures, following segments finely wrinkled on sides, last segment finely punctate and wrinkled, mostly with no more than four or six setae on apex; metatrochanter in both sexes with rounded or barely pointed tip, and mostly without seta. It is always possible, however, to find examples that have the seta, especially among the beetles from Albemarle Island. Middle tibiae of male with brush of red hair; anterior tarsi of male with three segments dilated and having dense brush on ventral side; depression on dorsal side of second segment present; second segment of hind tarsi three times as long as wide; punctation on tibiae and tarsi absent, except usual four rows of punctures bearing setae on tibiae, whereas most of the species of the subgenus *Castrida* have punctate legs. Penis slender, in some specimens very thin, with more or less pointed tip (figs. 62–74). However, examples from Chatham, Indefatigable, and Albemarle Islands have a

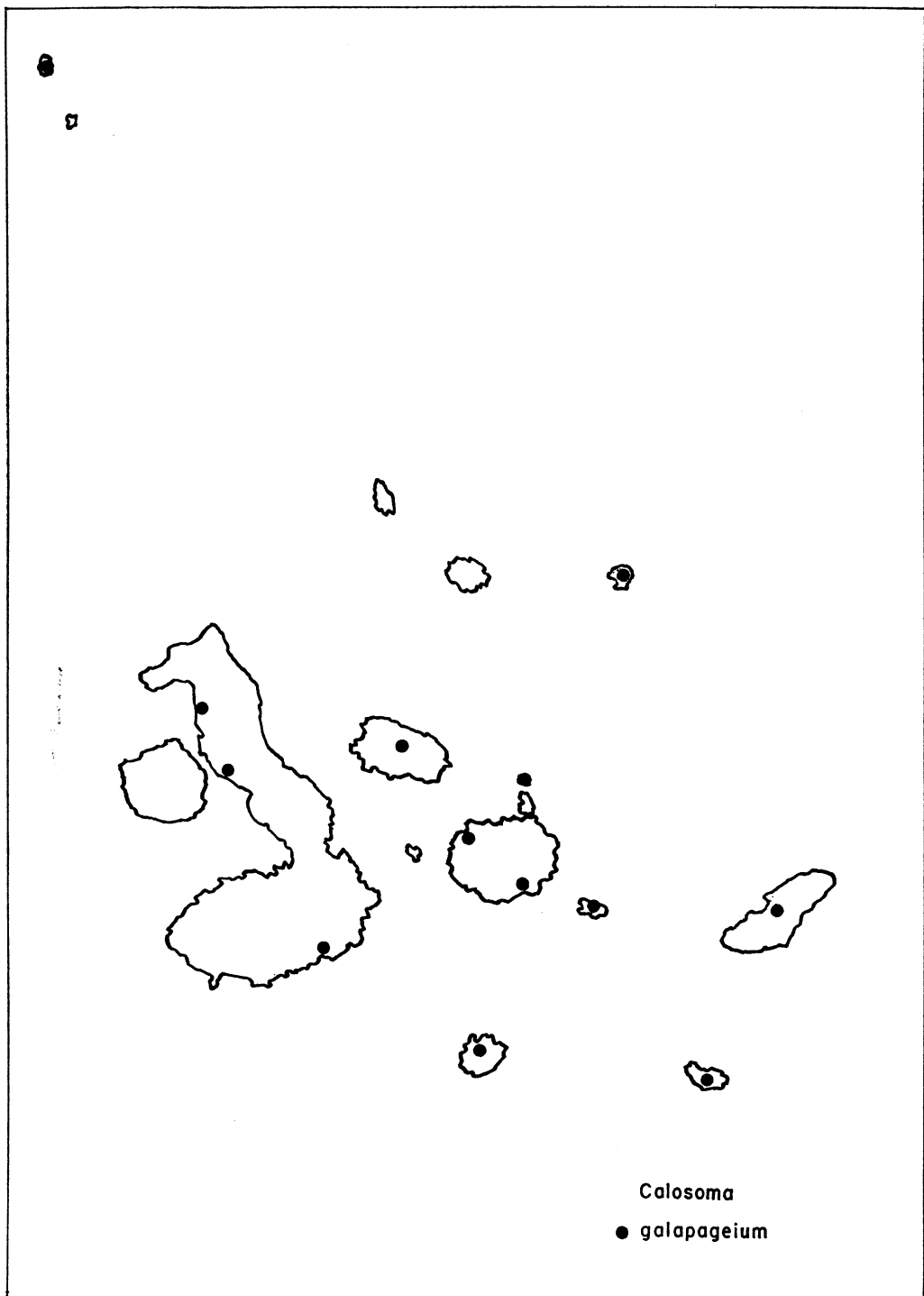


FIG. 2. Distribution of *Calosoma (Castrida) galapageium* Hope on the Galápagos Islands.

stouter penis (figs. 64–67); gonapophyses of usual type for *Calosoma*.

Length, 14.5–21 mm.; width, 6.5–9.5 mm. Most of the smallest specimens were found on Albemarle and Charles Islands; the largest, on Indefatigable, James, and Tower Islands.

The variation in size on different islands is presented in table 1.

DISTRIBUTION: In the literature there are indications that *galapageium* is found not only on the Galápagos Islands but also on the neighboring coast of the mainland—in Colombia and Peru at Callao (Breuning, 1927; Jeannel, 1940). I have seen examples only from the archipelago.

RECORDS (FIG. 2): *Galápagos:* Culpepper Island (Darwin). Albemarle (Ilsa Isabela): Tagos Cove; Banks Bay; Villamil. Indefatigable (Santa Cruz): Conway Bay; Academy Bay. South Seymour (Baltra). Barrington (Santa Fé). Chatham (San Cristóbal). Tower (Genovesa): Darwin Bay. James (San Salvador). Charles (Santa Maria). Hood (Española).

The species of *Calosoma* are generally found in the lowlands, although some forms are restricted to higher altitudes.

As with such animals as finches and tortoises, *galapageium* beetles vary from island to island but perhaps to a lesser degree than the other forms.

Van Dyke's *darwinia*, of which I have examined 91 specimens, including 30 paratypes from Villamil, Albemarle Island, is a little smaller and more slender than most of the forms from the other islands. The average length of the male is 17 mm.; of the female, 17.6 mm. Yet I found examples as large as 20 mm. The general color of the body is piceous, with a green luster, rather than black, with a bluish green luster.

Basal setae were present on the pronotum in 90 per cent of the beetles that were examined. The metatrochanter had a seta in 32 per cent of the specimens examined. The metepisternum is shorter than that of other forms, although not exactly square, and the wings are slightly reduced and, according to Van Dyke (1953), not functional. However, some specimens from Tagos Cove and Banks Bay, Albemarle Island, normally have a long metepisternum (fig. 15). The tip of the penis is generally thin, in some specimens thicker, closely resembling the beetles from Chatham or Indefatigable Islands (figs. 62–64).

Although *darwinia* is slightly different from the other forms of *galapageium*, it more clearly resembles the type of *galapageium* than most beetles from the other islands; it also has a brownish color, as does the type, a shorter metepisternum, and is small. As acknowledged by Van Dyke (1953), *darwinia* is an excellent example of the effect of isola-

TABLE 1
SIZE VARIATION IN *Calosoma* (*Castrida*) *galapageium* HOPE ON GALÁPAGOS ISLANDS

Locality	Males			Females		
	No. of Specimens	Size in Mm. Range	Average	No. of Specimens	Size in Mm. Range	Average
Albemarle						
Tagos Cove	6	18–19.5	18.5	15	17–20	19.3
Banks Bay	3	16–18	17.3	7	18.5–21	19.3
Villamil	65	15–20	17.0	26	16–20	17.6
Charles	19	14.5–20.5	17.5	5	19–19.5	19.0
Chatham	39	16–20	18.3	25	17–20	19.0
Indefatigable	5	18–21	19.6	9	18–21	19.5
Hood	1	—	17.5	5	16.5–20	18.7
James	3	18.5–21	19.5	3	16–19.5	18.3
South Seymour	—	—	—	2	18–20	19.0
Tower	—	—	—	13	19–21	20.0
Culpepper ^a	—	—	—	—	—	—
Barrington ^a	—	—	—	—	—	—

^a Specimens broken, not measurable.

tion, but I think it does not warrant the status of a species. Van Dyke thought that it had been derived from *howardi* stock and, being restricted to higher altitudes, was also isolated from *howardi* by seasonal occurrence, because it does not appear until late summer, while *howardi* appears early in spring.

The dates of collection on the material that I have examined cover most of the year. Large series were gathered on Albemarle Island at the end of March, the middle of April, and the end of August; on Charles and Indefatigable Islands in March; on Chatham Island in October, January, and February; and on James Island in the beginning of April.

I think it would be unreasonable to consider *darwinia* a subspecies, because we must then name all the other forms from every, or nearly every, island of the Galápagos, starting with the forms from Charles Island.

The beetles from Charles Island are deep black, with a navy blue luster, and the males are often as small as the smallest examples of *darwinia*. The penis is even more slender, with a long, thin tip, as in some extreme examples from Albemarle Island (figs. 68-70). The basal setae on the pronotum are absent in many specimens, and the metepisternum is distinctly longer than wide (fig. 16).

The forms from Chatham Island have almost completely lost the basal setae on the pronotum and the seta on the metatrochanter. They have a bluish green luster, as in specimens from all other islands except Albemarle and Charles. The tip of the penis is much thicker than that of males from the above-mentioned islands, but in the slender forms it is the same as that of some stout forms from Albemarle Island (figs. 65, 66).

Examples from James Island do not differ much from the specimens collected on Albemarle Island, except in color, which is bluish, and in having a longer metepisternum. But one specimen from the summit of the island, which I have examined, is peculiar. It has reduced wings, which are narrow and do not exceed one-half of the length of the elytra, and a correspondingly shorter metepisternum, without punctation (fig. 17); the humeri are more rounded; and the penis has a short, thin tip (fig. 72). This single specimen is very much like the type of *galapageium*, which is

also brown, with a bluish or purplish luster in the depressions and margin; it has no humeri, an almost square metepisternum (fig. 18), and consequently reduced wings, although they are slightly longer than those of the form from the summit of James Island. Also the penis of the type specimen has a short but slightly stouter tip (fig. 74). I have not seen the type of *galapageium*, but Dr. Britton from the British Museum (Natural History) examined it and kindly sent me the description and drawings.

In describing the type of *galapageium*, neither Hope (1837) nor Van Dyke (1953) mentioned the genitalia or metepisternum, although Van Dyke said that the type has "much reduced humeri and as a result almost certainly even more reduced wings than *darwinia*."

Van Dyke compared the type of *galapageium* with the specimen collected on the summit of James Island, and he thought that the type also originated from there because Darwin, who collected it, camped on James Island for several days.

Linell's *howardi*, which was described from the material collected by the "Albatross" expedition on different islands of the Galápagos, also inhabits the shores of James Island. It has a longer metepisternum than does the type of *galapageium* and normal wings (fig. 19). However, as proved by Darlington (1936), long- and short-winged individuals often occur together, irrespective of geographical isolation.

Breuning (1927) and Jeannel (1940) placed *howardi* as a synonym of *galapageium*. Andrews, who compared the type of *galapageium* with the cotype of *howardi*, also considered them conspecific (Breuning, 1927). Yet Van Dyke (1953) was sure that *howardi* "is most decidedly not a synonym of *galapageium*."

With more material from the summit of James Island, it may be possible to decide whether *howardi* is a subspecies of *galapageium*, which dwells in the interior of the island and probably gradually diverged as a result of isolation.

The forms from Indefatigable, South Seymour, Hood, and Tower Islands all have a bluish green luster; they are neither deep blue like the forms from Charles Island, nor green like those from Albemarle. The males from

TABLE 2

VARIATION IN CHARACTERS OF *Calosoma (Castrida) galapageium* HOPE ON THE GALÁPAGOS ISLANDS

Localities	Number of Specimens	Color	Basal Setae on Pronotum Present	Metepisternum	Wings	Meta-trochanter with Seta	Tip of Penis
Albermarle	123	Greenish	90%	Barely longer than wide	Slightly reduced	32%	Thin
Charles	24	Bluish	33%	Much longer than wide	Normal	Seta absent	Thin
Chatham	64	Bluish green	7%	Much longer than wide	Normal	1%	Thick
Indefatigable	14	Bluish green	67%	Much longer than wide	Normal	7%	Thick
Hood	6	Bluish green	Absent	Much longer than wide	Normal	Seta absent	Thick
James Summit	1	Greenish brown	Present	As wide as long	Reduced	Seta absent	Thin
Shore	6	Bluish green	86%	Much longer than wide	Normal	Seta absent	Thin
South Seymour	2	Bluish green	Present	Much longer than wide	Normal	Seta absent	Not examined
Tower	13	Bluish green	8%	Much longer than wide	Normal	Not examined	Not examined

Indefatigable and Hood Islands have a stouter penis, although it is more slender than that of some examples from Chatham Island (figs. 67, 71).

Most of the beetles from Indefatigable and South Seymour Islands have basal setae on the pronotum; those from Hood and Tower Islands have not.

The variation in characters is presented in table 2. In spite of these differences, I believe that they represent only variations of the same species, *galapageium*. The differences are not always distinct or constant, the characters often intergrade, and I have found examples that appear exactly similar, although they come from different islands.

From other species of the same subgenus, *galapageium* is distinguished by the blue luster and its smaller size. It often lacks the setae on the pronotum, especially the basal ones, which other species of the subgenus *Castrida*, except *rufipenne*, possess.

Géhin's *granatense*, according to Roeschke (1900), Breuning (1927), and Jeannel (1940), is a synonym of *galapageium*. Roeschke compared *granatense* from the mainland with the

type of *galapageium* and placed it as a synonym. Breuning, who possessed a specimen from the west coast of South America, compared it with the cotype of *howardi* and was positive that they were identical.

MATERIAL EXAMINED: Two hundred and eighty-eight specimens.

Calosoma (Castrida) fulgens Chaudoir

Figures 3, 75, 76

Calosoma fulgens CHAUDOIR, 1869, p. 370. Type locality: Paraguay.

DESCRIPTION: Reddish bronze, with green luster, some specimens brilliant green. Head finely, moderately, densely punctate and wrinkled; last segment of maxillary palpi shorter and only a little wider than preceding one; tooth of mentum small and pointed.

Pronotum twice as wide as long, with sides slightly arcuate; lateral margin narrow and bearing basal and middle setae; hind angles obtuse or pointed, in some specimens more rounded, and hardly projecting beyond basal line; disk wrinkled and finely punctate, more so toward base.



FIG. 3. Distribution of *Calosoma (Castrida) fulgens* Chaudoir and *C. (Castrida) argentinense* Csiki.

Elytra oblong oval, with almost parallel sides; elytral margin near humeri serrated; striae regular, deep, with large punctures; interstices normally scaly (punctures of each stria connected transversely with adjacent striae by arcuate lines), less convex than those of *alternans* or *sayi* and usually of equal width; foveae large and of same color as elytra.

Ventral side smooth, mesepisternum in some specimens with a few large punctures, metepisternum sparsely punctate at base, as well as first abdominal segment and sides of second one; following segments finely punctate, more so on sides; legs like those of *sayi* and *alternans*; metatrochanter arcuate and pointed in male, rounded in female; middle tibiae of male bearing small patch of red hair close to tip; all tibiae and tarsi finely punctate; second segment of hind tarsi two and a half to three times as long as wide; anterior tarsi of male with three segments dilated and bearing dense brush on ventral side. Penis arcuate, with strongly bent tip (fig. 75). This is the best character for separating *fulgens* from *alternans*, which resemble each other. Gonapophyses like those of *sayi* and *alternans*, with same rounded, leaf-like process, but with sides less arcuate than in *alternans*.

Length, 24–27 mm.; width 10–11 mm.

DISTRIBUTION: From Colombia to Uruguay, but not common.

RECORDS (FIG. 3): *Colombia*: Cali. *Ecuador*: Posorja; Guayaquil; Punta Santa Elena; Chin-Chan Pass. *Peru*: Tumbes. *Uruguay*: San Carlos. *Paraguay* (no locality given). According to Breuning (1927) and Jeannel (1940), the species occurs also in Bolivia.

It seems that *fulgens* prefers lowlands, such as the plains of Cali, with thickets of bushes and prairies, or grassland of savanna type, and fields with herbaceous vegetation.

This species is very like *alternans granulatum*, the most important difference being in the male genitalia; the tip of the penis in *fulgens* is strongly bent (fig. 75), while in *alternans* it is almost straight (fig. 77). Also the elytral interstices in *fulgens* are less convex, and usually of equal width, while in *alternans* they are strongly convex, with the second, sixth, and tenth much narrower than the adjacent ones. The females of *fulgens* also resemble those of *retusum* but differ in the

hind angles of the pronotum which are pointed in *fulgens* and rounded in *retusum*.

MATERIAL EXAMINED: Nineteen specimens.

Calosoma (*Castrida*) *alternans* Fabricius

Figures 4, 6, 20, 27, 43, 44, 85

I have not seen the type of Fabricius' *alternans* ("American Islands"), now in Zoologiske Museum in Copenhagen, but Mrs. Patricia Vaurie, who examined it, said that in respect to size and the elytra it resembles a specimen of Motschulsky's *coxale* (northern South America and the Lesser Antilles). Breuning (1927), who examined what he thought to be the type of *alternans*, which was at that time in Kiel, said that it is like the South American form *granulatum* Perty, conspecific with *coxale* Motschulsky. Jeannel (1940) saw a cotype of *alternans* and considered it and *coxale* synonyms.

In my previous work (Gidaspow, 1959) I attributed the name of *alternans* to the species from the Greater Antilles, as Breuning did (1927), because the beetles from there were known under that name for more than a hundred years.

One cannot make a definite distinction between *sayi* or *alternans* on the sole basis of Fabricius' original description (1792) of *alternans*, because the majority of the beetles of *sayi* also have the elytral interstices of unequal width. The difference between the two is that the second and sixth interstices of *sayi* are only slightly narrower than the adjacent ones, and in *alternans* they are very distinctly narrower. There are also other differences, but they are not mentioned in the original description. Yet, since all entomologists who have seen the type of *alternans* agree that it definitely resembles Motschulsky's *coxale* or Perty's *granulatum*, I have no choice, no matter how much I might wish to have the name *alternans* used for the species from the Greater Antilles.

Because *granulatum* is more shining with brilliant green luster on the head and pronotum and with coppery elytra, and because *coxale* is dustier, like the type, I think it would be better to place *coxale* and not *granulatum* as a synonym of *alternans*, as was done by Jeannel (1940).

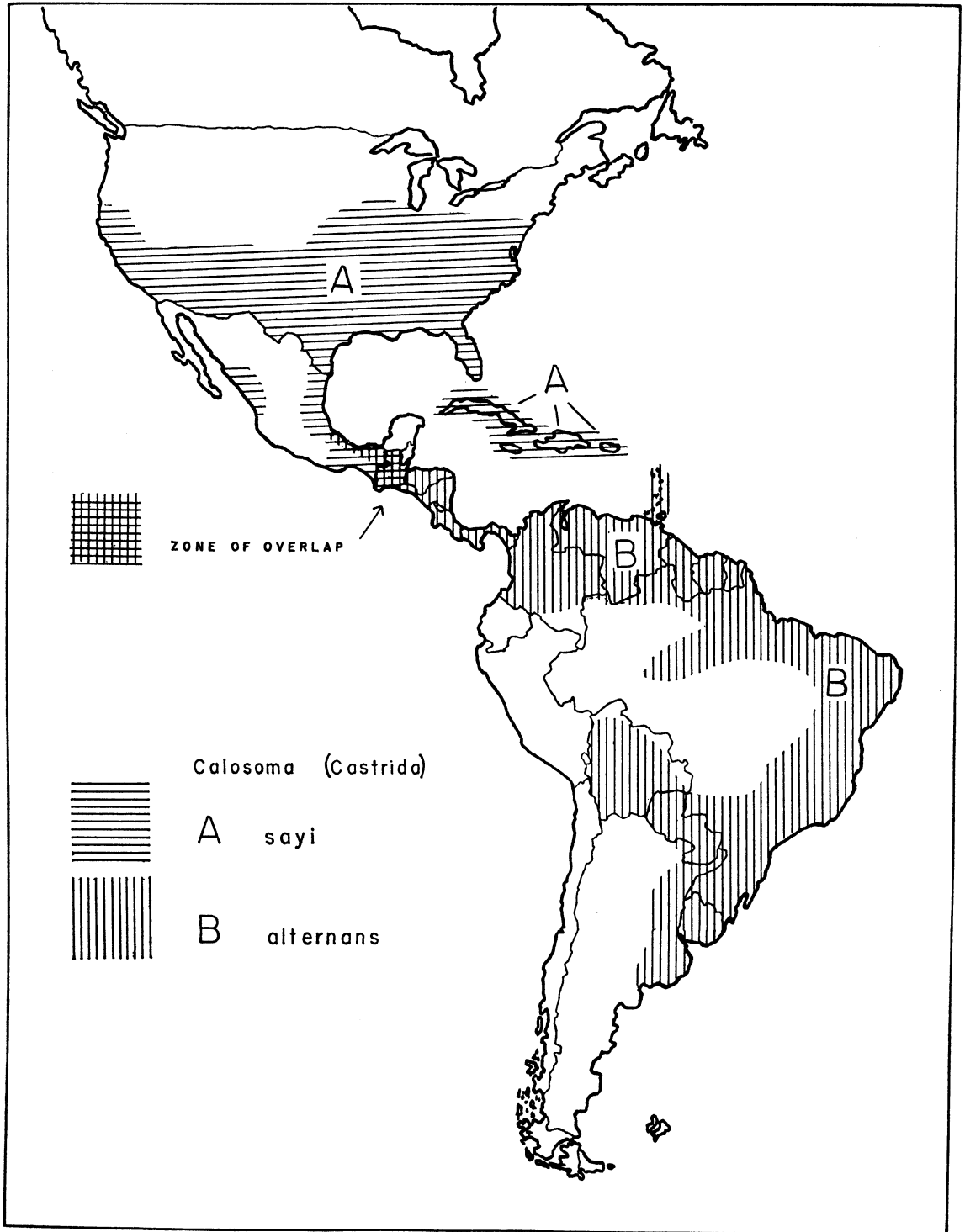


FIG. 4. Distribution of *Calosoma (Castrida) alternans* Fabricius, and *C. (Castrida) sayi* Dejean.

The forms from the central and southern parts of South America, known under the name of *granulatum*, are definitely conspecific with *alternans* (synonym *coxale*) and should be left as subspecies.

DESCRIPTION: *Calosoma (Castrida) alternans* is dark, with coppery bronze elytra, and often has green luster on the head, pronotum, and elytral margin (subspecies *granulatum*). Head finely wrinkled and moderately or more sparsely punctate, rugose near eyes; last segment of maxillary palpi a little shorter and not much wider than preceding one; tooth of mentum short, pointed, and with pore punctures.

Pronotum twice as wide as long; lateral margin narrow, with basal and middle setae; hind angles pointed, small, almost obliterated, not extending beyond basal line; disk wrinkled, in some specimens also punctate, at base and sides rugose.

Elytra oblong, with nearly parallel sides; margin near humeri normally serrated, rarely even or with traces of serration; striae deep, punctate, interstices convex and of unequal width, second, sixth, and tenth being much narrower than adjacent ones (in subspecies *alternans alternans* fourth, eighth, and twelfth interstices also often narrower); punctures of adjacent striae connected by transverse, arcuate lines, making elytra scaly; foveae large, golden, or coppery.

Ventral side dark brown, in some specimens with green luster (mostly in subspecies *granulatum*); proepisternum smooth or finely wrinkled; mesepisternum, metepisternum, and first abdominal segment with large, sparse punctures, second and third segments with smaller punctures, following ones finely punctate on sides or entirely; metatrochanter without setae, in male strongly arcuate and pointed on tip, in female straight and slightly pointed (figs. 43, 44); middle tibiae in both sexes distinctly arcuate and in male with small patch of red hair; second segment of hind tarsi almost three times as long as wide; anterior tarsi of male with three segments dilated and bearing dense brush on ventral side; second segment with depression on dorsal side. Penis slender, with thin, straight tip, inner armature ending in long hook, as in *sayi* (fig. 77); female genitalia like those of *sayi*, but leaf-like process somewhat less spoon-

shaped, furrow near tip of process rounded or oval, bearing two tiny setae (fig. 85).

Length, 23–30 mm.; width, 10–12 mm.

Calosoma alternans is a polytypic species with two subspecies: *alternans alternans*, inhabiting northern and northwestern South America (Venezuela, Colombia, northern Brazil, British Guiana) and Central America, including southern Mexico, and the Lesser Antilles; and *alternans granulatum*, occupying central and southern South America, except the extreme south (Brazil, south of the river Amazon, Paraguay, Bolivia, Uruguay, and Argentina).

This species is apparently well adapted to humid climates. It inhabits regions with dense forests, such as the lowlands of the states of Amazonas and Minas Geraes, but it is found also in the drier deciduous scrub forests with tropical and subtropical scrub and thorns, such as Rio Grande do Norte in Brazil and Santa Cruz in Bolivia, on the grass plains of Argentina, and on sugar-cane plantations or other cultivated fields.

Apparently there is not much difference in the habits of the two subspecies. Although *alternans alternans* lives in northern South America, it occurs, as does *alternans granulatum*, in the regions of evergreen forests, in the area of savanna where the grass is mixed with bushes (Caracas Valley), on pastures (Maracay), and on plantations (Caracas and Georgetown).

The species *alternans* and *sayi* undoubtedly originate from the same stock. The most distinct difference between them is in the width of the elytral interstices, the second, sixth, and tenth being much narrower than the adjacent ones in *alternans* and only slightly narrower, or are of equal width, in *sayi*. Only the tenth elytral interstice of *sayi* is normally distinctly narrower than the adjacent interstice. The elytral margin in *alternans* is, in most specimens, serrated near the humeri, and is not, or barely so, serrated in *sayi*. The hind angles of the pronotum are in most instances more pointed in *alternans*. The anterior tarsi of males of *alternans* are more dilated, and all three segments have a dense brush on the ventral side, while in *sayi* only two segments have a brush, and the first one is partly glabrous. In some males of *sayi* all three segments are glabrous on the ventral side, as

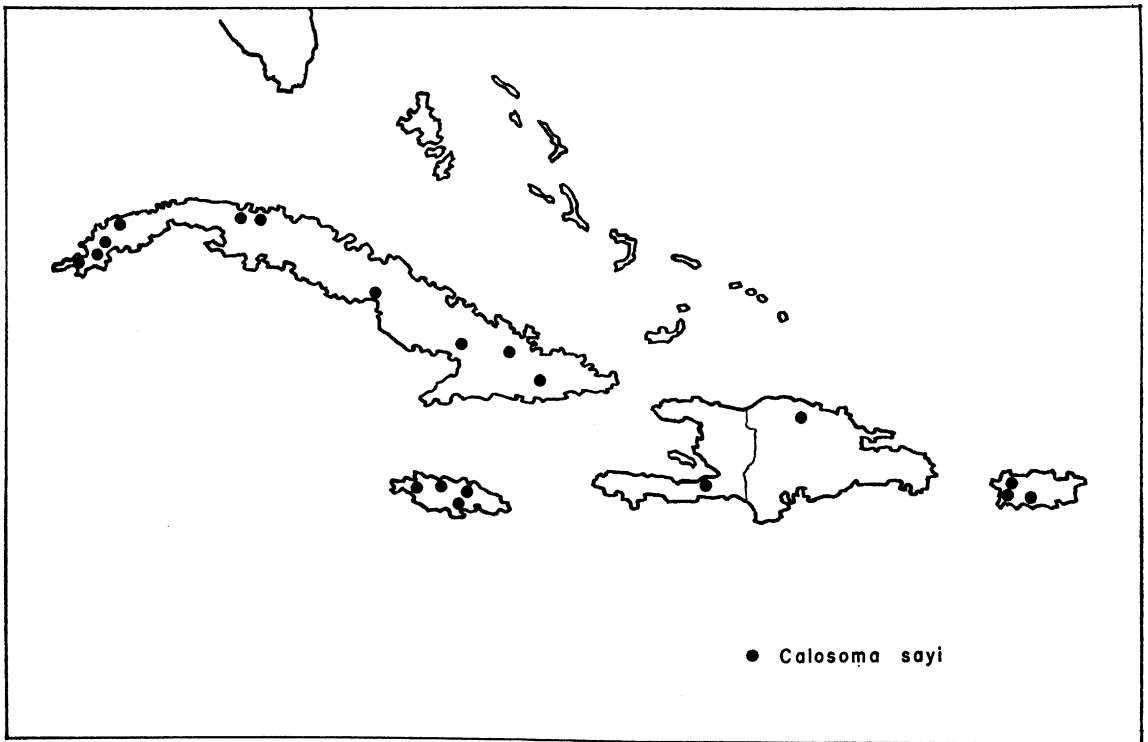


FIG. 5. Distribution of *Calosoma (Castrida) sayi* Dejean on the Greater Antilles.

they normally are in females. However, in large series of *alternans* I have seen a few specimens with the first segment partly or entirely glabrous.

Calosoma (Castrida) alternans alternans
Fabricius

Carabus alternans FABRICIUS, 1792, p. 146. Type locality: "American Islands."

Callistriga coxale MOTSCHULSKY, 1865, p. 307; new name for *Calosoma armatum* Reiche, 1842, p. 377, preoccupied by *armatum* Castelnau (1835), a synonym of *sayi* Dejean. Type locality: Venezuela.

The notable difference between the two subspecies *alternans* and *granulatum* is the dustier color of *alternans*, which lacks the brilliancy and green luster of *granulatum*. In addition, the elytral interstices of *alternans*, which bear foveae, are narrower than the adjacent ones. However, in many specimens from Venezuela these interstices are of the same width, as usual in the subspecies *granulatum*. The pronotum in *alternans* is a little smaller and has more pointed side angles.

Yet this character is not constant; it almost disappears in the forms from Colombia but is more distinct in specimens from Venezuela. At the same time the subspecies *granulatum* from Pernambuco, Brazil, has the same form of pronotum as does *alternans* from Venezuela.

DISTRIBUTION: The subspecies *alternans alternans* inhabits northern South America and the Lesser Antilles and occurs as far north as southern Mexico.

RECORDS (FIG. 6): *Mexico:* Cordoba. *Panama:* Chiriqui. *Colombia:* La Garita. *Venezuela:* Distrito Federal: Caracas Valley; Turmero. Carabobo: Las Trincheras; Maracay. Falcon: Paraiso. Bolivar. Bermudes: Caripito. El Valle on Isla Margarita (Nueva Esparta). San Fernando de Apure on Apure River. La Vuelta (not found on the map). *British Guiana:* Georgetown; Upper Rupununi. *Brazil:* Santarem? *Lesser Antilles:* St. Croix; St. Barthelemy; Dominica; Martinique; Trinidad. According to Breuning (1927), the species occurs also in Ecuador and Peru, but I have seen no material to confirm

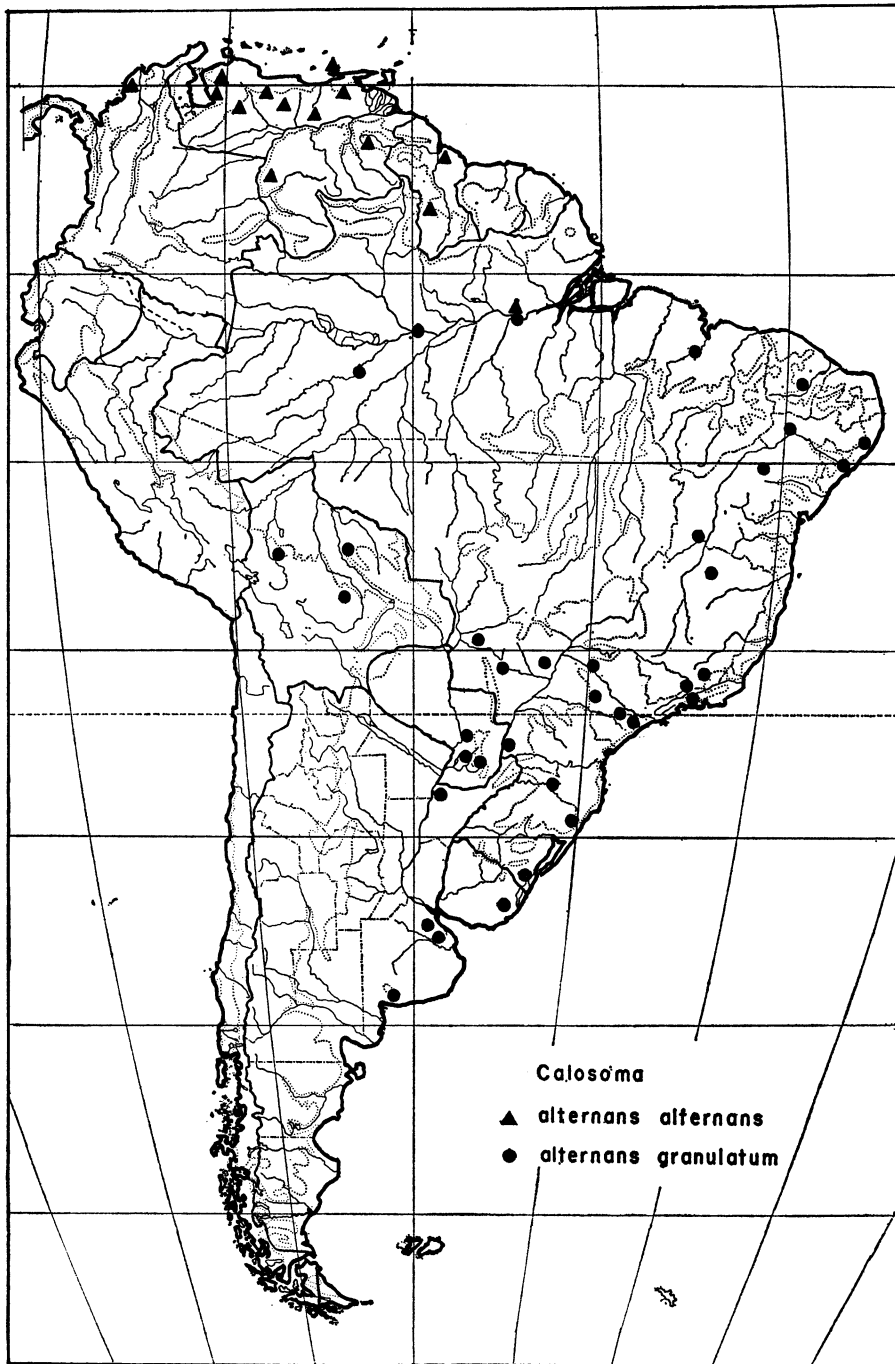


FIG. 6. Distribution of *Calosoma* (*Castrida*) *alternans alternans* Fabricius and *C. (Castrida)* *alternans granulatum* Perty.

this. Jeannel (1940) supposed that *alternans* was also found in the Greater Antilles (Puerto Rico), but it does not occur farther north than the islands of St. Croix and St. Barthelémy. The single specimen that I have seen from Santarem, Brazil, is either a stray (carried by wind or otherwise), or was mislabeled, because Santarem is the locality of the subspecies *granulatum*. However, northern Brazil is inhabited by *alternans alternans*.¹

MATERIAL EXAMINED: Ninety-three specimens.

Calosoma (Castrida) alternans granulatum
Perty

Calosoma granulatum PERTY, 1830, p. 9, pl. 2, fig. 9; new name for *Calosoma laterale* Dejean, 1826, p. 199, preoccupied by *laterale* Kirby, 1818, p. 379, a synonym of *retusum*. Type locality: Rio de Janeiro, Brazil.

Calamata rugata MOTSCHULSKY, 1865, p. 308. Type locality: South America.

Calosoma orbigny GÉHIN, 1885, p. 59; new name for *Calosoma imbricatum* Brullé, 1838, preoccupied by *imbricatum* Klug, 1832. Type locality: Patagonia, Argentina.

The subspecies *granulatum* differs from *alternans alternans* in its more shining, reddish coppery elytra with green margin and its brilliant green luster on the head and pronotum, the latter with more rounded side angles. Also the interstices bearing foveae are normally of the same width as the adjacent ones in *granulatum* and a little narrower in the subspecies *alternans*. Unfortunately these characters, except for the color, are not constant, and I have found individuals that are not distinguishable by the form of the pronotum or by the width of the elytral interstices.

DISTRIBUTION: Common in most of Brazil, except the northern part, and in the eastern regions of Argentina; occurring also in Bolivia, Paraguay, and Uruguay.

RECORDS (FIG. 6): *Brazil*: Amazonas: Manaus: Manicore. Para: Santarem; Tejuco River. Maranhao: Jussural. Rio Grande do

¹ Since the time of submission of the present paper, I have seen five more specimens from Santarem, Brazil, which more closely resemble *alternans alternans* than *alternans granulatum*, which has cast doubt on the taxonomic status of *granulatum* and *alternans* as subspecies. With more material available from the zone of intergradation their status could be decided.

Norte: Jaguariba River. Mato Grosso: Corumba River; Salobro. Pernambuco: Recife. Alagoas: Pedro. Bahia: Joaseiro; San Antonio de Barra; Villa Victoria; Bomfin. Goyaz. Minas Geraes: Passa Quarta; Lavras. Parana: Rolandia; Rio Deodoro. Rio de Janeiro: City of Rio de Janeiro; Alto de Serra. São Paulo: City of São Paulo; Angatuba; Ypiranga River; Piracicaba Mountains. Santa Catarina: Lanca; Cauna; Joinville; Nova Teutonia; Rio Negrinho; Hansa Humboldt. Rio Grande do Sul: Pelotas; Porto Alegre. *Bolivia*: Province del Sara; Santa Cruz; Buena Vista. *Paraguay*: Paso Yobay; Alto Parana; Villarica; Tucua. *Argentina*: Misiones; Corrientes; La Plata; Buenos Aires; Bahia Blanca; Patagonia. *Uruguay*: Montevideo.

The area between the two subspecies is not exactly known, although *granulatum* apparently does not occur farther north than the Amazon River (southern part of Amazonas and Para states). The southern limit of its distribution is probably in northern Patagonia, because the form described by Brullé (1838) as *imbricatum*, a synonym of *granulatum*, was collected there.

Roeschke (1900) considered *granulatum* (as *laterale*) a South American form from Brazil and Argentina. He recognized the variety *coxale* from Venezuela and Colombia. The form *alternans*, according to him, inhabits North America and the Antilles.

Breuning (1927) said that the type of Fabricius' *alternans*, which he had seen, was more like *granulatum*; nevertheless he did not rename the forms from the Greater Antilles but followed Roeschke. However, Jeannel (1940), who examined the cotype of Fabricius' *alternans*, considered *coxale* to be a synonym of it, and *granulatum* a subspecies.

MATERIAL EXAMINED: One hundred and forty-one specimens.

Calosoma (Castrida) sayi Dejean

Figures 4, 5, 28, 32, 39, 77

Calosoma sayi DEJEAN, 1826, p. 198. Type locality: Mexico.

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

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

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

Calosoma cuprascens ROESCHKE, 1900, p. 71. Type locality undetermined.

This North American species is abundant in the United States and occurs southward as far as Guatemala and the Greater Antilles.

It resembles *alternans* but differs in the width of the elytral interstices, the second and sixth being either slightly narrower than the adjacent ones or all of equal width, while in *alternans* they are distinctly narrower. Also the anterior tarsi of the males of *sayi* have only two segments with a dense brush on the ventral side, whereas *alternans* males have three.

RECORDS (FIG. 5): (For localities in the United States and Mexico, see Gidaspow, 1959.) *Guatemala*: Tiquisate. *Greater Antilles*: *Cuba*: Guanahacabibes Peninsula; Cienfuegos; Holguin; Jobabo; Guantanamo. *Jamaica*: Montego Bay; Claremont; Old Harbour; Saint Andrew; Port Antonio. *Haiti*: Port au Prince. *Dominican Republic*: Santiago. *Puerto Rico*: Mayaguez; Anasco; Desengano; Ponce.

There is little difference between the forms living on the mainland and those on the islands, but a typical form from the Greater Antilles is slightly smaller and brighter. The average size of 90 specimens examined from the islands is 24 mm. (range, 19–28 mm.), while the average size of 100 specimens from the mainland is 27 mm. (range, 22–30 mm.). There is considerable overlap; also, large and dark examples, like typical forms from the mainland, are found on the islands, many on Puerto Rico, a few on Haiti.

Therefore it seems best not to recognize any subspecies.

The specimens collected on different islands also do not differ much, except that, as is stated above, darker forms are found on Puerto Rico and Haiti, and beetles from Jamaica have a light serration on the elytral margin that is absent in the specimens from the other islands.

The history of *sayi*, as well as of *alternans*, is very confusing. Dejean (1826) considered that *sayi* was a full species, different from *alternans* auctorum, and was found on the mainland. Roeschke (1900), Breuning (1927), and Gidaspow (1959) placed it as a subspecies of *alternans* auctorum. Jeannel (1940) recognized it as a separate species.

MATERIAL EXAMINED: Two hundred and sixty-eight specimens, of which 90 are from the Greater Antilles.

Calosoma (*Castrida*) *vagans* Dejean

Figures 7, 30, 34, 38, 42, 80, 81

Calosoma vagans DEJEAN, 1831, p. 564. Type locality: Chile.

DESCRIPTION: This is the only species of the subgenus *Castrida* without metallic luster; it is dark brown, with elytra that are slightly lighter, often reddish, but darker than in *rufipenne*.

Front of the head finely wrinkled and finely, sparsely punctate, rarely more densely punctate, near occiput and clypeus smooth; last segment of maxillary palpi shorter and distinctly wider than preceding one (fig. 38); tooth of mentum very short, in specimens from Argentina almost blunt, more pointed in examples from Peru and Chile (about 40% of the beetles examined had a pointed tooth).

Pronotum twice or nearly twice as wide as long, widest shortly before middle; sides slightly arcuate, lateral margin narrow, with basal and middle setae; hind angles obtuse, projecting beyond basal line; disk almost smooth, finely wrinkled, sparsely punctate and rugose at base.

Elytra with regular, punctate striae, interstices less convex than in other species of *Castrida*, seldom flat, with fine, transverse wrinkles, deeper toward sides; foveae small, not occupying the width of one interstice, but distinct, in some specimens with faint metallic luster; elytral margin near humeri even or with traces of serration.

Ventral side black or brown, proepisternum smooth, mesepisternum, metepisternum, and first abdominal segment with large, sparse punctures, following segments with finer punctation, in most cases on sides, last one wrinkled and bearing from four to six setae on apex instead of usual eight; third, fourth, and fifth segments with two setae each; metatrochanter without seta, in both sexes with rounded or barely pointed tip (fig. 42); middle tibiae of male with brush of red hair; front tibiae smooth, without fine punctures, so common in other members of subgenus *Castrida*; in males all three segments of anterior tarsi dilated and with dense brush on

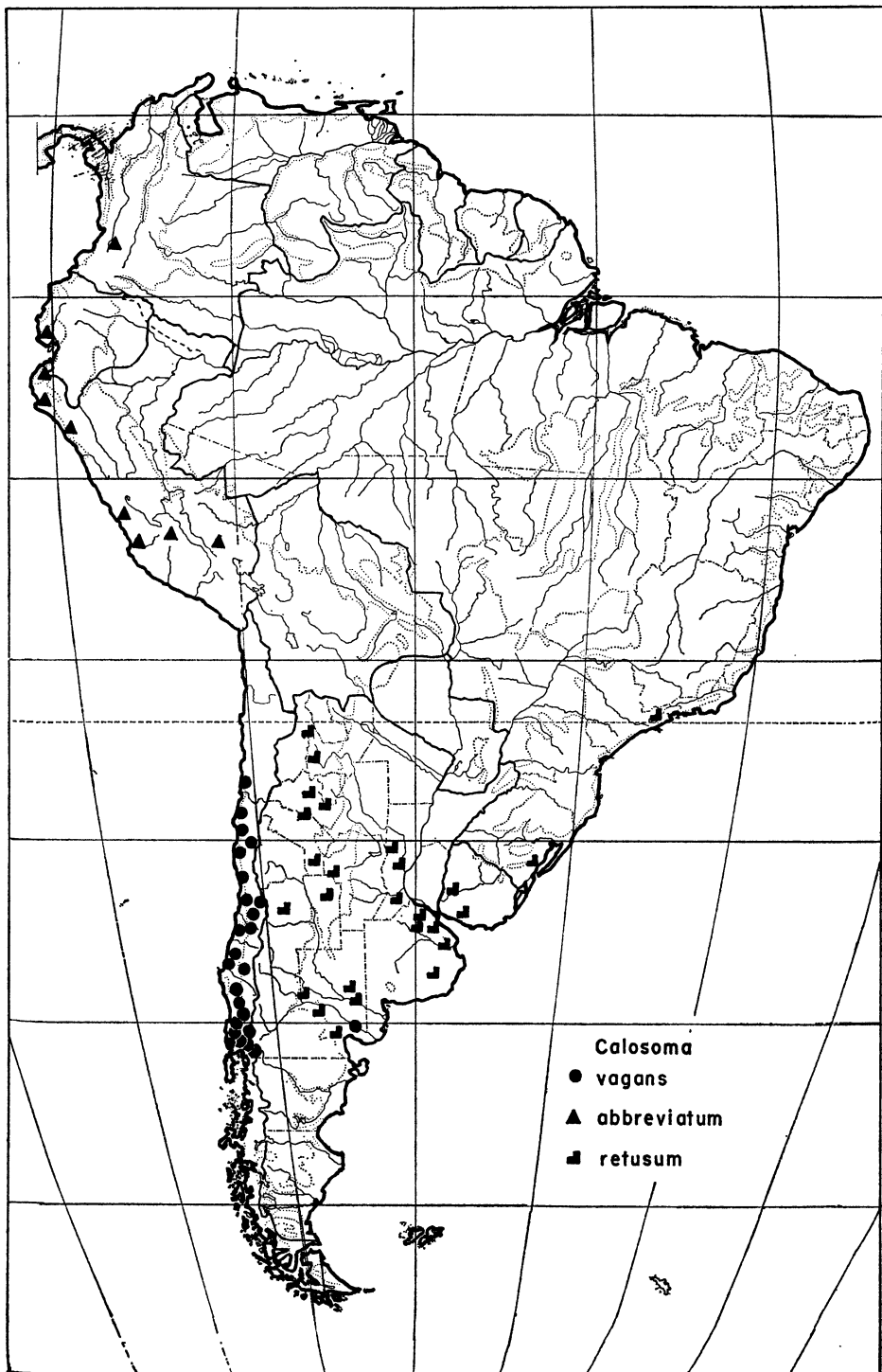


FIG. 7. Distribution of *Calosoma* (*Castrida*) *vagans* Dejean, *C.* (*Castrida*) *retusum* Fabricius, and *C.* (*Castrida*) *abbreviatum* Chaudoir.

ventral side; second segment of anterior tarsi, and in some specimens also the third one, with slight depression on dorsal side, not conspicuous in every case; second segment of hind tarsi not more than twice as long as wide (fig. 34). Penis wide, with round, slightly bent tip, recalling that of *peregrinator* (fig. 80). Gonapophyses of usual type, leaf-like process narrowly rounded on tip, with elongated furrow bearing two tiny setae.

Length, 19–25 mm.; width, 8.5–10.5 mm.

DISTRIBUTION: Southern South America, common in Chile, occasional in Peru and Argentina, mostly in mountainous regions and on plateau covered by brushwood, or in cultivated fields, as in the provinces of Aconcagua and Bio Bio, in the dry areas of Concepcion, Maule, and Coquimbo, and in the regions with rather cold winters, such as Carrizal, and other places on high mountains.

RECORDS (FIG. 7): *Peru:* No special locality given. *Argentina:* Neuquen: Teilen. Rio Negro. Patagonia. *Chile:* Atacama: Carrizal. Coquimbo: Guampulla; Higuera; La Serena; Los Loros. Aconcagua: Casablanca. Valparaiso. Santiago: City of Santiago; Ciperes. Curico: Vichuquen. Maule: Negueeha. Nuble: San Fabian de Alico; Recinto. Concepcion: Pangal; Caudal River. Malleco: Angol. Bio Bio: City of Bio Bio; Bayo. Cautin: Temuco; Quepe. Valdivia: Panguipulli Lake; Ronco Lake; Puñirre; Villarrica; Valdivia. Yunque Island.

This species differs from others of the subgenus *Castrida* in its uniform brown color without metallic luster. It more clearly resembles *glabratum*, but the latter has the sides of the pronotum angulated and without basal setae, the middle tibiae in both sexes straight, the metatrochanter with a seta, and different genitalia. It also belongs to a different subgenus, *Camedula*.

MATERIAL EXAMINED: One hundred and thirty-eight specimens.

***Calosoma (Castrida) retusum* Fabricius**

Figures 7, 10, 26, 35, 47, 48, 78, 79, 88

Carabus retusum FABRICIUS, 1775, p. 237. Type locality: Patagonia.

Calosoma laterale KIRBY, 1818, p. 379. Type locality: undetermined.

Calosoma bonariense DEJEAN, 1831, p. 560. Type locality: Buenos Aires, Argentina.

Calosoma patagoniense HOPE, 1837, p. 129. Type locality: Patagonia.

DESCRIPTION: Metallic green or bronze, with bright green luster, specimens from southern Brazil reddish bronze. Head sparsely or more densely punctate and deeply wrinkled, rugose near eyes; punctures larger and sparser than those of *argentinense* and *abbreviatum*, which this species resembles; tooth of mentum pointed. In specimens from Rio de Janeiro, Brazil, and some individuals from Montevideo, Uruguay, the tooth of the mentum is blunt and the body is less shining than in forms from Argentina. Last segment of maxillary palpi as long as, though distinctly wider than, preceding one.

Pronotum twice or more than twice as wide as long, widest in middle; sides slightly arcuate; hind angles rounded, projecting beyond basal line; disk lightly wrinkled and finely, sparsely punctate, toward base rugose; lateral margin slightly wider at base; middle and basal setae present.

Sides of elytra parallel; margin near humeri slightly serrated; striae deep, punctate, punctures connected by lines; punctures of adjacent striae connected by transverse arcuate lines, making elytra scaly; interstices convex and of equal width, but tenth one often narrower; foveae large.

Ventral side dark brown, with light metallic luster; proepisternum smooth, mesepisternum, metepisternum, first and second abdominal segments slightly wrinkled and in some specimens also punctate on sides, last segment more coarsely punctate, and bearing from four to eight setae on apex; third, fourth, and fifth segments with two to four setae each; metatrochanter without seta, in female with rounded tip, in male not truncate as in *abbreviatum* but slightly curved and more or less pointed at lower end (figs. 47, 48); middle tibiae and middle tarsi usually finely, sparsely punctate; anterior tarsi of male with three segments broadly dilated, second one twice as wide as long, depression on dorsal side present, all three segments having brush on ventral side; second segment of hind tarsi rarely more than twice as long as wide (fig. 35). Tip of penis rounded, slightly bent, inner armature with long hook, as in *argentinense* (figs. 78, 79). Gonapophyses of usual type, tip

of leaf-like process less pointed than that of *argentinense* (fig. 88).

DISTRIBUTION: Southern South America, very abundant in Argentina, where it is found from Salta and Tucuman to Rio Negro; apparently absent in Chile.

Although *retusum* can be found in the forests of southern Brazil, it seems to prefer drier regions with sparse vegetation, such as the plains with dry brush and desert scrub in Santiago del Estero, Santa Fé, and Pampa. It is also found on grassland, alfalfa, and pastures of Mendoza, San Luis, and Buenos Aires.

RECORDS (FIG. 7): *Brazil:* Rio de Janeiro. Santa Catarina: Nova Teutonia. Rio Grande do Sul: Pelotas. *Uruguay:* Santa Lucia; Montevideo. *Argentina:* Jujuy: East Yoto. Salta: Rosario. Tucuman: Zelaya. Santiago del Estero. Santa Fé: Rio Salado; Rio Parana; La Hersilia. Cordoba: Capilla del Monte. Mendoza: San Rafael. San Luis: Lago del Peje. Buenos Aires: City of Buenos Aires; Olivos; La Plata; Tandil. Pampa: Rio Colorado. Rio Negro: Cipolletti; Lamarque. According to Breuning (1927), also in Bolivia.

Calosoma retusum, although it resembles *argentinense* and *abbreviatum*, is easily distinguished from them. The sides of the pronotum are more rounded, with rounded hind angles that extend backward. It also has a smoother head and pronotum with sparse punctures. Its elytral striae have distinct punctures, and the interstices are less convex and not scaly. Its color is brighter, with brilliant green luster. The other two species have the pronotum narrowed posteriorly, the hind angles almost obliterated and more pointed, the head and pronotum densely punctate, the elytral striae with inconspicuous punctures, the interstices more convex, more scaly, and are of a dustier color.

The specimens of *retusum* collected in southern Brazil (Nova Teutonia and Pelotas) resemble *alternans granulatum* and could be easily mistaken for the latter. Yet in *retusum* the elytral interstices are of equal width, the metatrochanter of the male is not arcuate and in the female more rounded, the last segment of the maxillary palpi is shorter and stouter than the preceding, the male genitalia have a slightly bent tip, and the leaf-like process of the female has arcuate sides (figs. 78, 88).

In *granulatum*, the second, sixth, and tenth elytral interstices are narrower than the adjacent ones, the metatrochanter is arcuate and pointed in the male and slightly pointed in the female, the last segment of the maxillary palpi is barely shorter and barely wider than the preceding one, the male genitalia have an almost straight tip, and the leaf-like process of the female is rounded and spoon-shaped, as in *sayi* (Gidaspow, 1959, p. 339, fig. 175).

As proved by Breuning (1927) and Jeannel (1940), *Calosoma laterale* Kirby, *bonariense* Dejean, and *patagoniense* Hope are synonyms of *retusum*. The *bonariense* which was mentioned by Campos (1921) is apparently not the same as Dejean's *bonariense*. The Campos specimen was collected in Ecuador, where *retusum* (synonym *bonariense*) does not occur. Breuning (1927) thought that Campos mistook *abbreviatum* for *bonariense*.

MATERIAL EXAMINED: Eighty-eight specimens.

Calosoma (Castrida) abbreviatum Chaudoir

Figures 7, 23, 49–52, 82

Calosoma abbreviatum CHAUDOIR, 1869, p. 371. Type locality: Peru or Bolivia.

DESCRIPTION: Dark metallic green or dark reddish bronze, with green luster. Head wrinkled and densely or moderately punctate; last segment of maxillary palpi shorter and wider than preceding one; tooth of mentum small and pointed.

Pronotum twice or more than twice as wide as long, narrowed posteriorly, widest before middle; hind angles pointed and extending barely if at all beyond basal line; lateral margin with basal and middle setae; disk densely wrinkled and punctate.

Elytra with more or less parallel sides, in some slightly wider toward apex; margin near humeri serrated; foveae large, normally bright; striae deep, imprinted lines, with fine or inconspicuous punctures, interstices convex and of equal width, scaly from base to apex.

Ventral side brown, proepisternum and mesepisternum smooth, metepisternum with a few large punctures; abdominal segments finely, sparsely punctate, finely wrinkled and with larger punctures on sides; last abdom-

inal segment bearing eight setae on apex; third, fourth, and fifth segments with two to four setae each; metatrochanter truncate, especially in males, slightly pointed at lower end, usually without seta (figs. 49–52); middle tibiae of male with brush of red hair which may be as long as in *rufipenne*, and in some individuals as thin as a row of sparse setae; anterior tarsi of male with three segments dilated and having dense brush on ventral side, first segment half glabrous, second one without depression on dorsal side, which is usual for the subgenus *Castrida*; second segment of hind tarsi not more than twice as long as wide. Penis moderately wide, with short, rounded, and straight tip (fig. 82); gonapophyses like those of *retusum*.

Length, 22–25 mm.; width, 8.5–10 mm.

DISTRIBUTION: Northwestern South America, in cotton-growing regions of Piura and Ica valleys in Peru, on the brush-covered plains of Colombia (Cali), and other regions where cultivated fields must be protected from the moving dunes, and sand reaches the foothills of the oak forests, as in Libertad and parts of Piura and Ica.

RECORDS (FIG. 7): *Colombia*: Cali. *Ecuador*: Santa Helena. *Peru*: Piura. Tumbes: Quiroz on the Paucartambo River. Libertad: Cartavio. Lima. Huancavelica: Ica. *Bolivia* (Chaudoir, 1869).

This species resembles *retusum* and *argentinense* but differs from them in the dustier color, in the truncate, not rounded, metatrochanter, in the absence of a depression on the second segment of the anterior tarsi of the male, and in the stouter penis with shorter tip. From *retusum* it differs also in the form of the pronotum, with its almost obliterated hind angles, and in the inconspicuous punctures on the elytral striae.

Except for slight color variations, there is not much difference in the specimens of *abbreviatum* from various places. Most forms from Cartavio have reddish bronze elytra, with only faint green luster.

MATERIAL EXAMINED: One hundred and thirteen specimens.

***Calosoma (Castrida) argentinense* Csiki**

Figures 3, 11, 21, 29, 45, 46, 83

Calosoma argentinense CSIKI, 1927, p. 11; new name for *antiquum* Dejean, 1831, p. 561, pre-

occupied by *antiquum* Fourcroy, 1785, synonym of *inquisitor*. Type locality: Cordoba, Argentina.

DESCRIPTION: Coppery or bronze, with green elytral margin and sides of pronotum, some specimens with the same green luster as in *abbreviatum*, which it resembles. Head and pronotum as densely punctate and wrinkled as those of *abbreviatum*; last segment of maxillary palpi also shorter and wider than preceding one; tooth of mentum small and pointed.

Pronotum less narrowed posteriorly than that of *abbreviatum*, with sides less arcuate, and lateral margin slightly wider at base; hind angles almost obliterated, obtuse, less pointed than those of *abbreviatum*; basal and middle setae also present.

Elytra a little more elongated than those of *abbreviatum*, although this character is not so distinct as is usually represented in the literature; striae imprinted lines with very fine, in some cases inconspicuous, punctures, as in *abbreviatum*; interstices as scaly, but the tenth interstice in some narrower than adjacent ones, while in *abbreviatum* it is not; elytral margin near humeri serrated.

Last abdominal segment bearing more setae than does that of *abbreviatum*, up to 12 on apex; metatrochanter not truncate, rounded in female, slightly pointed in male (figs. 45, 46); depression on dorsal side of second segment of anterior tarsi in male conspicuous. Penis with slender, bent tip (fig. 83), while that of *abbreviatum* is short, stout, and straight (fig. 82). Female genitalia like those of *abbreviatum*.

Length, 20–25 mm.; width, 8–11 mm.

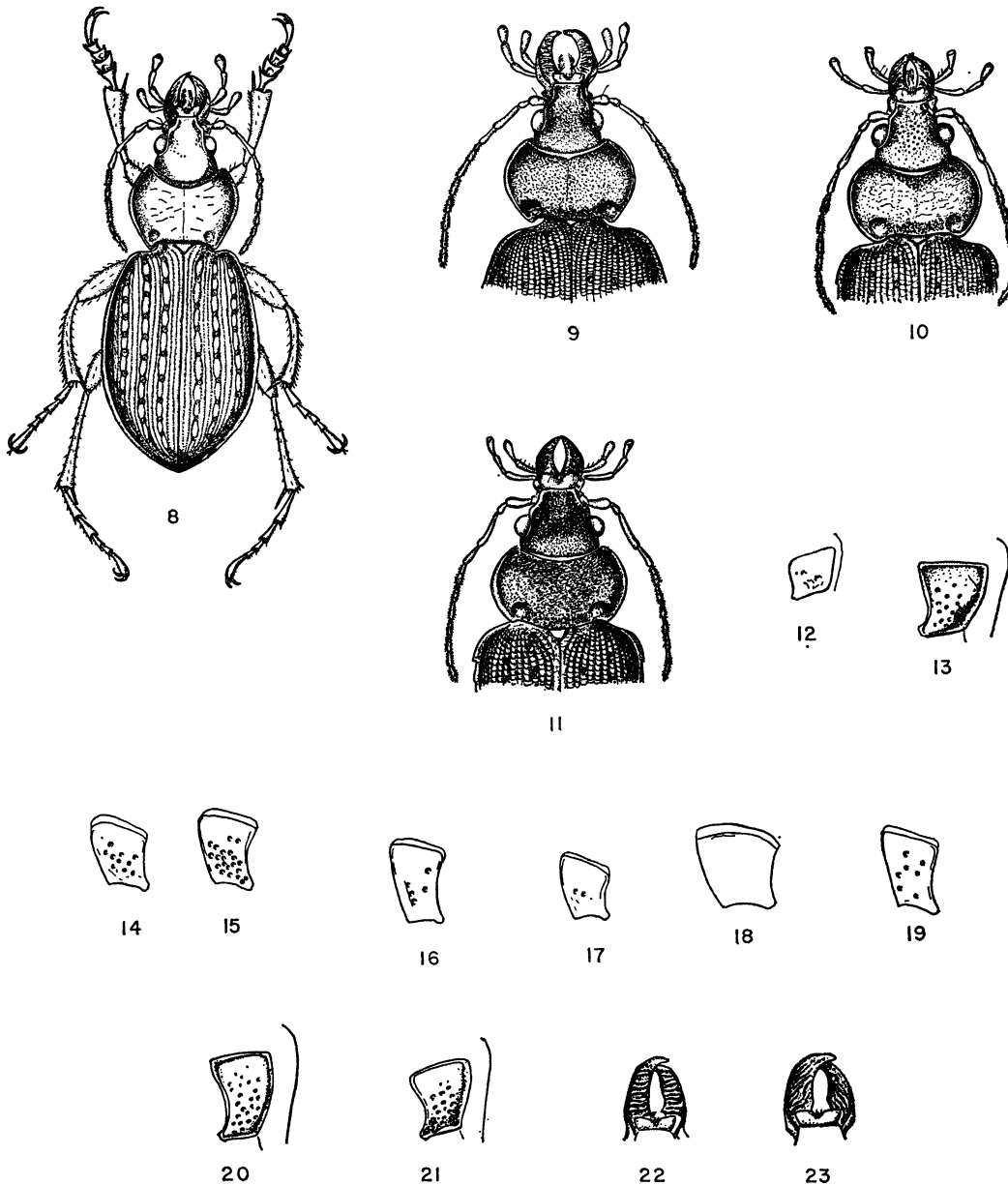
DISTRIBUTION: Southern South America, from southern Brazil and Bolivia to northern Patagonia, but mostly in the northern and central provinces of Argentina. Apparently, *argentinense* prefers drier regions. It is found in Sierra Cordoba, which is covered by xerophyte forests, in the sparse woods of the Salto Mountains, in the dry regions of Salado River, in the dry valleys of Pampa, with brush and desert scrub or isolated grass bushes on barren soil, and in the pastures of La Rioja and plantations in Jujuy and Tucuman. In these regions it is very common.

RECORDS (FIG. 3): *Brazil*: Rio de Janeiro. *Argentina*: Jujuy. Alta: Metan. Chaco. Cata-

marca. Tucuman: City of Tucuman; Campo; Tabia. Santiago del Estero: Rio Salado; Santiago. La Rioja: Agua Colorada. San Luis. Cordoba: City of Cordoba; Agua del Oro; Del Monte; Rio Cuarto. Santa Fé: Las Garzas; Rosario. Buenos Aires: City of Buenos Aires; Estacion Albarino; Paia; Tablillo. Pampa: Santa Rosa. Neuquen: Lake Nahuel Huapi. According to Breuning (1927), it also occurs in La Paz, Bolivia, and, according to Jeannel (1940), in San Antonio, Paraguay.

Although *argentinense* resembles *abbreviatum*, it is not difficult to distinguish them. *Calosoma argentinense* is slightly reddish; *abbreviatum* is greenish. Also the form of the metatrochanter is different, in *argentinense* pointed, in *abbreviatum* truncate. A depression on the dorsal side of the second segment of the front tarsi in the male of *argentinense* is absent in *abbreviatum*.

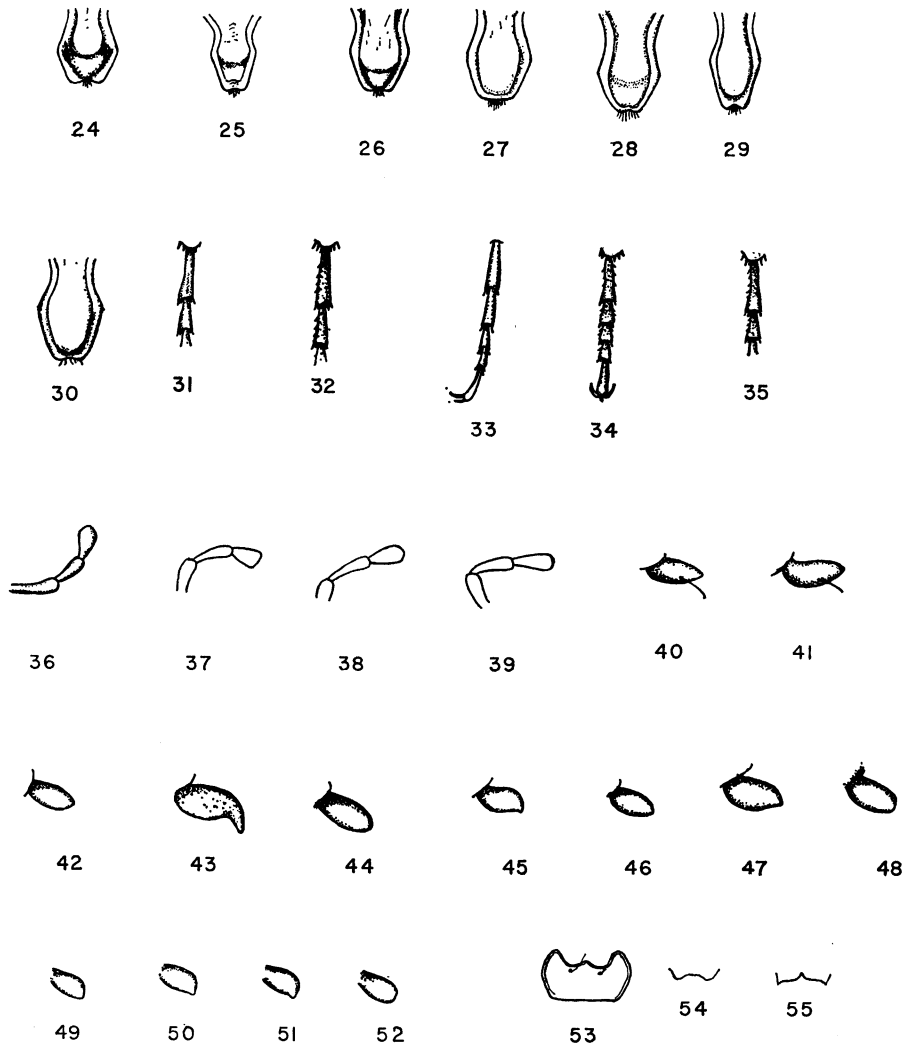
MATERIAL EXAMINED: Eighty-eight specimens.



FIGS. 8-11. Dorsal views. 8. *Calosoma (Microcalosoma) linelli* Mutchler. 9-11. Head, pronotum, and part of elytra. 9. *Calosoma (Castrida) trapezipenne* Chaudoir. 10. *C. (Castrida) retusum* Fabricius. 11. *C. (Castrida) argentinense* Csiki.

FIGS. 12-21. Metepisterna, ventral views. 14-19. Left metepisterna. 12, 13, 20, 21. Right metepisterna. 12. *Calosoma (Microcalosoma) linelli* Mutchler. 13. *C. (Castrida) trapezipenne* Chaudoir. 14-19. *Calosoma (Castrida) galapageium* Hope. 14. From Albemarle Island, Villamil. 15. From Albemarle Island, Banks Bay. 16. From Charles Island. 17. From James Island, summit. 18. Type of *galapageium* Hope. 19. From James Island, shore. 20. *C. (Castrida) alternans granulatum* Perty. 21. *C. (Castrida) argentinense* Csiki.

FIGS. 22, 23. Mandibles, dorsal view. 22. *Calosoma (Castrida) trapezipenne* Chaudoir. 23. *C. (Castrida) abbreviatum* Chaudoir.



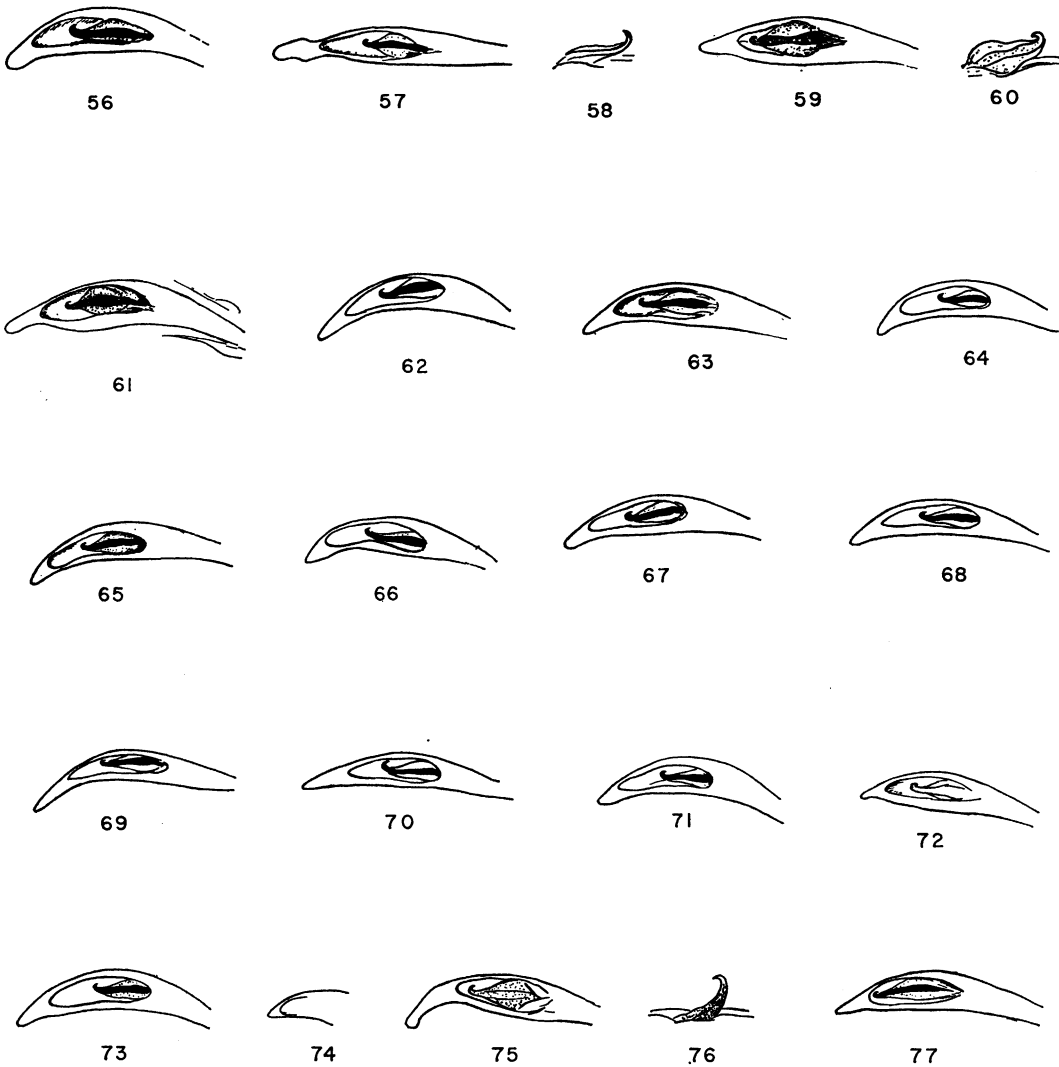
FIGS. 24-30. Prosternal process, ventral view. 24. *Calosoma (Castrida) trapezipenne* Chaudoir. 25. *C. (Castrida) galapageium* Hope. 26. *C. (Castrida) retusum* Fabricius. 27. *C. (Castrida) alternans* Fabricius (from South America). 28. *C. (Castrida) sayi* Dejean (from the Greater Antilles). 29. *C. (Castrida) argentinense* Csiki. 30. *C. (Castrida) vagans* Dejean.

FIGS. 31-35. Hind tarsi. 31, 32, 35. First and second segments. 33, 34. All five segments. 31. *Calosoma (Castrida) rufipenne* Dejean. 32. *C. (Castrida) sayi* Dejean. 33. *C. (Microcalosoma) linelli* Mutchler. 34. *C. (Castrida) vagans* Dejean. 35. *C. (Castrida) retusum* Fabricius.

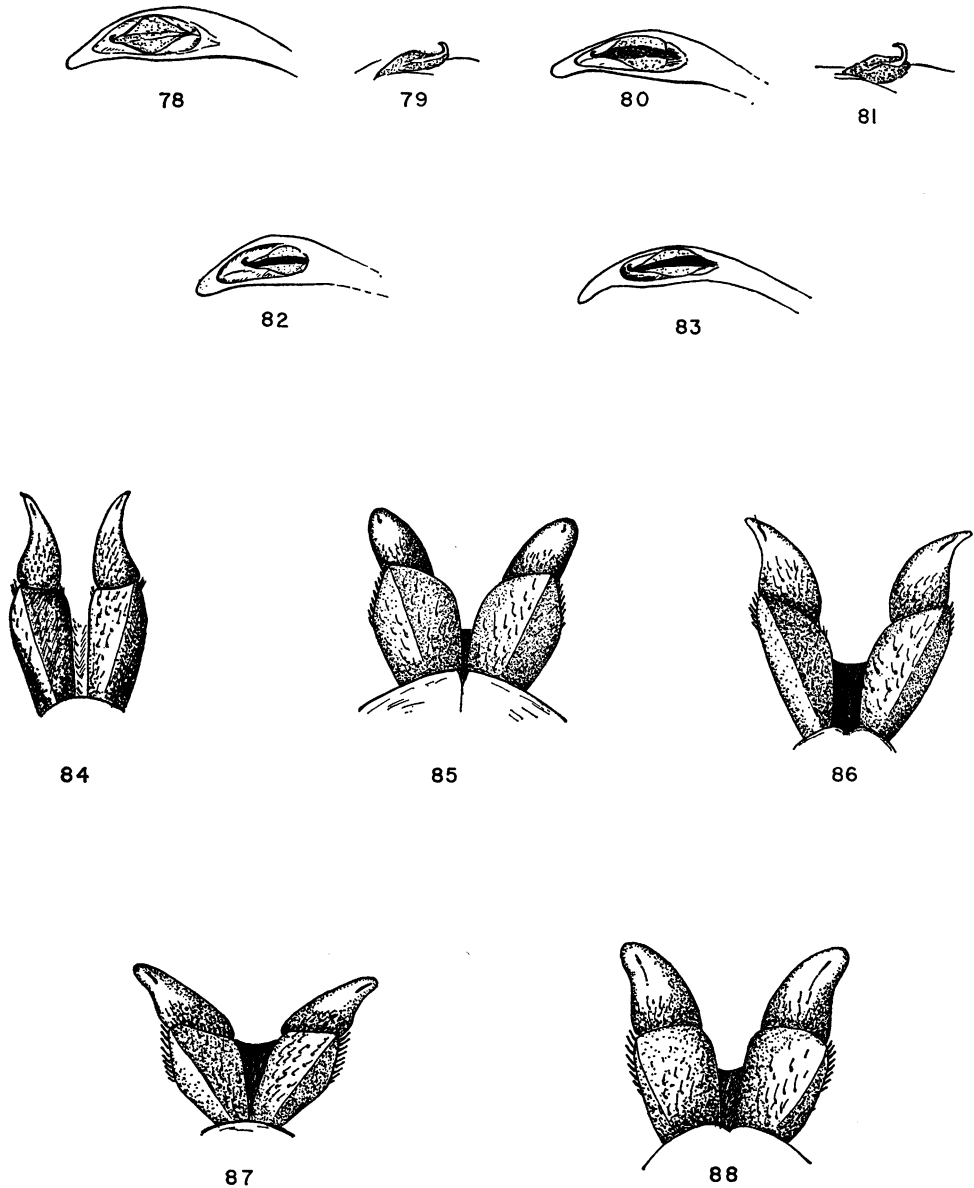
FIGS. 36-39. Palpi maxillary. 36. *Calosoma (Microcalosoma) linelli* Mutchler. 37. *C. (Castrida) rufipenne* Dejean. 38. *C. (Castrida) vagans* Dejean. 39. *C. (Castrida) sayi* Dejean.

FIGS. 40-52. Metatrochanter, ventral view. 40, 41. *Calosoma (Castrida) trapezipenne* Chaudoir. 40. Male. 41. Female. 42. *C. (Castrida) vagans* Dejean, male. 43, 44. *C. (Castrida) alternans* Fabricius. 43. Male. 44. Female. 45, 46. *C. (Castrida) argentinense* Csiki. 45. Male. 46. Female. 47, 48. *C. (Castrida) retusum* Fabricius. 47. Male. 48. Female. 49-52. *C. (Castrida) abbreviatum* Chaudoir. 49-51. Males. 52. Female.

FIGS. 53-55. *Calosoma (Castrida) trapezipenne* Chaudoir. 53. Mentum and tooth of mentum. 54, 55. Individual variations of tooth of mentum.



FIGS. 56-77. Male genitalia with inner armature exposed. 58, 60, 76. Inner armature, side views. 56. *Calosoma (Camedula) glabratum* Dejean. 57, 58. *C. (Microcalosoma) linelli* Mutchler. 59, 60. *C. (Castrida) trapezipenne* Chaudoir. 61. *C. (Castrida) rufipenne* Dejean. 62-74. *C. (Castrida) galapageium* Hope. 62. From Albemarle Island, Banks Bay. 63, 64. From Albemarle Island, Villamil. 65, 66. From Chatham Island. 67. From Indefatigable Island. 68, 69, 70. From Charles Island. 71. From Hood Island. 72, 73. From James Island. 72. From summit of island. 73. From shore. 74. Type of *galapageium* Hope. 75, 76. *C. (Castrida) fulgens* Chaudoir. 77. *C. (Castrida) sayi* Dejean (from the Greater Antilles).



FIGS. 78-83. Male genitalia, with inner armature exposed. 79, 81. Inner armature, side views. 78, 79. *Calosoma (Castrida) retusum* Fabricius. 80, 81. *C. (Castrida) vagans* Dejean. 82. *C. (Castrida) abbreviatum* Chaudoir. 83. *C. (Castrida) argentinense* Csiki.

FIGS. 84-88. Female genitalia, ventral views. 84. *Calosoma (Microcalosoma) linelli* Mutchler. 85. *C. (Castrida) alternans granulatum* Perty. 86. *C. (Castrida) trapezipenne* Chaudoir. 87. *C. (Castrida) rufipenne* Dejean. 88. *C. (Castrida) retusum* Fabricius.

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