

A REVISION OF THE GENUS  
*Trox* IN SOUTH AMERICA  
(COLEOPTERA, SCARABAEIDAE)

PATRICIA VAURIE

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## INTRODUCTION

THE NUMBER OF RECOGNIZED SPECIES of the genus *Trox* of the world, monographed by Harold in the third quarter of the nineteenth century, when only about 100 species were known, has now more than doubled. No second monograph of these lamellicorn beetles has been published, but the species have been revised on a faunal basis by several authors: by Balthasar (1936) for the species of the Palearctic Region (34 species),<sup>1</sup> by Haaf (1953, 1954a, 1954b) for those of the Ethiopian, Oriental, and Australo-Papuan regions (117 species), and by Vaurie (1955) for those of the Western Hemisphere, exclusive of South America (41 species). The present revision covers the species of the Neotropical Region (35). Additional species not included in the revisions mentioned above have been described by Báguena (1959), Haaf (1954c, 1955, 1957a, 1957b, 1958a, 1958b), Howden and Vaurie (1957), Micsic (1958), Nakane (1954), and Nomura (1937). With these additions, and the overlap of species in some regions taken into account, the total number of species is about 235—75 in the Western Hemisphere and about 160 in the Eastern Hemisphere.

The genus is quite readily recognizable, and many authors, including those of the *Zoological Record* (since 1922), consider that it constitutes a separate family, the Trogidae. I believe, however, that the species of the genus *Trox* are so similar, externally at least, to those of the family Scarabaeidae that the close relationship is best shown by keeping them in the Scarabaeidae as a subfamily, the Troginae, as has been done by Balthasar (1936), Haaf (1953, 1954a, 1954b), and Ritcher (1958). The genera *Glaresis* and *Cryptogenius* are also in the Troginae.

Thirty-five valid species of *Trox* are known from South America (including eight new ones), of a total of 43 forms described. That a modern revision should contain so few synonyms as eight of 43 is a reversal of the general trend. In North America, for example, the proportion of synonyms was found to be as high as 20 of 63 forms described, or about one-third.

<sup>1</sup> Seven of these species are found also in other regions.

The majority of species from South America were described between 1822 and 1876, the only earlier ones being *scaber* Linnaeus, 1767, and *suberosus* Fabricius, 1775, both of which are species not restricted to South America. Harold leads the list of authors of South American species, with 11 species, then comes Blanchard with seven, Curtis with three, Burmeister with two, and the remainder with one each: Erichson, Eschscholtz, Fabricius, Fairmaire, Germar, Guérin, Gutiérrez, Linnaeus, Mutchler, Olivier, Van Dyke, and Vaurie. I now add eight new species, which are listed below because their names appear in the keys that precede the descriptions:

*bifurcatus*, Sara Province, Bolivia  
*brasiliensis*, Ypiranga, São Paulo, Brazil  
*diffuens*, Leyda, Santiago, Chile  
*ecuadorensis*, Quito, Ecuador  
*haafi*, Golfe St. Georges, Coli-Huapi, Argentina  
*neuquen*, Neuquen, Argentina  
*persuberosus*, Ypiranga, São Paulo, Brazil  
*spatulatus*, Buenos Aires Province, Argentina

The only revisionary works that include South American species, as opposed to isolated descriptions, are those of Burmeister (1876) for species from Argentina only, and Harold (1872) for those of the world. Harold's monograph includes keys and diagnoses in Latin and detailed descriptions in German. As far as I can judge from his treatment of South American species, this study is exceptionally fine, which is the more surprising because he distinguished his species without the aid of the characters of the male genitalia. The only species that I was unable to identify from his descriptions alone were those in the *gemmifer-gemmingeri-sallei* complex of very similar species, of which some individuals can be determined with certainty only by an examination of the genitalia. All the South American species appear in Harold's monograph except for 13 species described subsequently. Burmeister's revision of 12 species (there are 26 known at the present time from Argentina) includes also pertinent general remarks on the genus and its characters.

The most typical South American species are those of the *brevicollis* and *bullatus* groups, species with the clypeus bent sharply down-

ward and under, and with the scutellum heart-shaped or U-shaped (see key to groups in Systematic Section). There are no species of this type north of the equator in the Western Hemisphere. In Africa there are only a few species with the clypeus bent, and there not so sharply, and the species from Africa differ further from those of South America by having the basal piece of the male genitalia very large in proportion to the size of the lobes. Only one-fourth or one-fifth of the species in South America are in the *suberosus* group (clypeus horizontal and scutellum sagittate), known previously as the subgenus "*Omorgus*," whereas on the North American continent almost one-half of the species (17 of 43) belong in this group. No "*Omorgus*"-like species occurs in Europe, but some occur in Australia and Africa. With the exception of *scaber*, which is not a native of South America, there are no species in South America either of the European *perlatus* type, or of the North American type represented by species of the *scaber*, *terrestris*, *tuberculatus*, and *unistriatus* groups which have the bases of the pronotum and elytra contiguous, and the scutellum oval, or U-shaped. Absent also from South America are species with the sides of the pronotum very coarsely crenate as in some species from Africa, and species with distinct keels or carinae on the pronotal disc as in Australian species.

#### TYPES AND NUMBER OF SPECIMENS

The types of all but two of Harold's species were fortunately available to me for study at the Muséum National d'Histoire Naturelle in Paris. I have examined also the types of Curtis, Erichson, Fabricius, Mutchler, Van Dyke, and Vaurie, a total of 17 of the 35 forms described previously. The seven types of Blanchard were not found in Paris, but there are in the museum many specimens from Patagones and Patagonia, Argentina, collected in 1834 by d'Orbigny on his voyage to the New World; these specimens are part, at least, of the material from which Blanchard described his *Trox*. Three of the remaining types (Burmeister and Gutiérrez) are in South America (I have seen cotypes), and the other seven were not found in the

European museums visited by me in 1961.

The types of the species described in the present paper are deposited in various museums, as stated in the text under the species.

Approximately 1650 specimens have been examined. Some species are evidently abundant, but others are quite rare in collections. Thus I have seen more than 100 specimens of *brevicollis*, *pilularius*, and *suberosus*, but fewer than 10 of the following: *candezei* (four specimens), *diffluens* (one specimen), *ecuadorensis* (eight), *galapagoensis* (four and one elytron), *haafi* (six), *longitarsis* (nine), *neuquen* (five), *pampeanus* (six), and *tenebrosus* (two).

#### TREATMENT

Characterization of the genus has been worked out thoroughly by previous authors and is not repeated in the present paper. Synonymy of the genus is recorded, however, as some additions have been made since the Junk catalogue (Arrow, 1912). The synonymy of *Trox scaber* and *T. suberosus*, which occur elsewhere than in South America, is given for South America only.

The South American species are here divided into five groups, which are discussed below. In the Systematic Section, after the keys to the species groups and to the species, the characters common to the members of the first group are assembled. In the formal presentation of the species these characters are not repeated. In fact, for the sake of brevity, in each group the first species only is described fully, and subsequent species are compared with it. I have made a few exceptions for some very similar species which are compared with each other (*tenebrosus* with *ecuadorensis*, *spatulatus* with *pastillarius*, *candezei* with *ciliatus*) instead of with the first species of the group.

Citations do not include all references to the species (for which catalogues should be consulted) but only synonyms and references to papers containing illustrations of the species involved. For every species, after the diagnosis and range and before the description, I give a short paragraph stating the size of the beetle, the kind of wing and male genitalia, and the general aspect of the dorsum.



## NOTES ON SPECIES GROUPS

The synonyms of *Trox* given below in the Systematic Section (except for *Pseudotrox*, which was synonymized by Vaurie, 1955, p. 18) were considered to be subgenera by Borre (1886, p. 66) and by Arrow (1912, p. 53). The majority of modern workers, however, as well as Harold (1872), have not used subgenera in their classifications. Characters that are constant for a group of species in one part of the world are not necessarily so in another part, and the choice of different characters results often in the placing of a species now in one group, now in another. If these groups are given subgeneric names and thus receive nomenclatural standing, they become formalized and static, whereas group names can be changed at will.

There are a number of ways of grouping the 35 species of South America. Burmeister (1876), for instance, proposed five groups, to which he gave names, for the dozen or so species of Argentina, and he attempted to fit in also some 38 species from other parts of the world. He arranged his groups in the form of a synoptic and annotated key. His largest subdivisions were based on the shape of the posterior border of the pronotum (whether merely arcuate, or angulate and forming a lobe in front of the scutellum) and on the wings (absent, short, or long). Flightless species with the arcuate posterior border were again divided according to the covering of the tarsi and the shape of the median ridges on the pronotum (his *Chesas* group for one species, and *Polynoncus* for six). The normally winged species Burmeister divided into those with the scutellum "hastate" or sagittate (*Lagopelus* for one species, *Omorgus* for 18 exotic species), and those with it either elliptical or "cordato-triangulari" ("true" *Trox*) for 26 species. Further subdivisions within the category of winged species were based on the width, shape, and serration of the tibiae, the tuberculation of the elytra, and the ciliation of the margins of the pronotum. Although Borre (1886) called these divisions subgenera, as stated above, in my opinion Burmeister did not intend them as such, for he mentions (1876, p. 263) several times "*die natürliche Gruppierung*" and "*Gruppe*."

I have chosen a rather different set of

characters for the principal grouping which divide the species in larger groups, use less variable characters, and seem to me to group the species more naturally. The division of my five groups (see synoptic table in Systematic Section) depends primarily on the kind of clypeus and the kind of male genitalia, secondarily on the size of the eyes, the presence or absence of inner wings, the elytral surface, and the shape of the scutellum. In my classification Burmeister's *Lagopelus* and *Chesas* groups fall within the *suberosus* group, his *Polynoncus* in my *bullatus* group, and his "true" *Trox*, my *brevicollis* group. He placed *scaber* (my *scaber* group of one species only) with "true" *Trox*, and he did not have *batesi* (my *batesi* group of one species).

## MORPHOLOGY

The anatomy of *Trox* was discussed in detail by Harold (1872) and by Balthasar (1936), in the latter case with emphasis on the species of the Palearctic Region. Vaurie (1955) commented on the diagnostic characters of the species of North America. Following is a discussion of some characters pertaining to species found in South America.

## CLYPEUS AND HEAD

With the exception of *batesi*, *scaber*, and the eight species of the *suberosus* group, the clypeus of South American species is bent abruptly downward in front, like the side of a drop-leaf table. The bent part usually takes the form of a flattened isosceles triangle (figs. 35, 36), of which the obtuse angle is sharp in most species but rather rounded off in others (*aeger*, *ecuadorensis*, *patagonicus*, *pedestris*). The front portion of the clypeus in the other species is horizontal in position, not bent down, and is either triangular or rounded in front. The shape and position of the clypeus are good diagnostic characters.

The head, on the other hand, is not of much importance in diagnosis. It generally has two tubercles between the eyes which appear either as round swellings (when the coating of the head is thick), or as elongate, subparallel, or oblique swellings (when the surface is bare). *Trox scaber*, however, has a row of setae on the head instead of tubercles.

## ANTENNAE

The antennae, with their long first segment, or scape, their short, six-segmented funicle, and their three-segmented, lamellate club, are fairly uniform among species, except for the color and the color of the bristly hairs adorning them, which may be red or yellowish, or black or dark gray. The funicle in most species emerges from underneath the scape, not from its apex as is apparently true of *Trox scaber* alone.

## PRONOTUM

The shape of the lateral and basal margins of the pronotum is often diagnostic of the species, but is subject to some variation within the species. Thus the degree of emargination of the sides near the base varies individually, but also some species without emargination do present individuals which show a slight sinuosity in that area. The lobed basal margin in *gemmifer* is so feeble in some specimens that it resembles the flatly curved, not lobed, base present in the species *haafi* and *neuquen* (also in *galapagoensis*, *seymourensis*, *pedestris*, and the four species of the *bullatus* group). The arrangement of the elevated black parts of the pronotum is significant, but it may appear quite different according as the coating or encrustation obscures or reveals the basic pattern (see figs. 23 and 24 of *guttifer*).

## ELYTRA

The majority of South American species of *Trox* have 10 elytral intervals separated by punctate striae, although the latter are often obscured by the over-all encrustation characteristic of these beetles and supplemented in many cases by caked mud or grease. The intervals, except for those of one smooth, glabrous species (*batesi*), carry a longitudinal row of shining, flat, black plaques (Blanchard called them "*pastilles*"), or elevated tubercles, or tufts of setae, or setose tubercles, all of which are generally more prominent or larger on some intervals (usually the alternate ones) than on others. Harold (1872, pp. 11-12) called these larger or principal intervals the "*Ordines*" or "*Haupttreihen*"; in the majority of species they are the odd intervals, i.e., the suture (or first interval), and the third, fifth, seventh, and ninth intervals. The even intervals, or intervals between the principal ones (Harold's "*intervalla*" or "*Zwischenreihen*"),

are the second, fourth, sixth, eighth, and tenth, and they have usually less elevated or smaller tubercles. In three species (*borrei*, *pastillarius*, *spatulatus*), the pattern is reversed, the principal rows being the even ones. The kind of tubercle, whether flat and glabrous, elevated and glabrous, elevated and tomentose, glabrous at base but setose on top, entirely coated, punctate or impunctate, round or elongate, is characteristic of certain species or groups of species, but the size of the tubercles and their number in a row vary individually in quite a few species. In some species even the shape and the punctuation of the tubercles are not uniformly constant. The elytral sculpture of a number of species is almost identical—*pastillarius* with *spatulatus*, *pilularius* with *gemmingeri*, *bullatus* with *patagonicus*, *aricensis* with *peruanus*, *suberosus* with *persuberosus*, *ecuadorensis* with *tenebrosus*, and the trio of *gemmifer*, *haafi*, and *neuquen*. Two species (*aeger*, *brasiliensis*) have an additional short row, making a sort of carina, of contiguous tubercles on the outer side of the elytra between the humeral umbone and the margin.

## LEGS

The South American species, except for *loxus*, *persuberosus*, and *suberosus*, have serrated middle and hind tibiae which vary among individuals a great deal in the number and size of the serrations. The inner edges of these tibiae have exceedingly long hairs in *candezei*, *ciliatus*, *guttifer*, and *hemisphaericus*, and the tarsi are furnished also with very long hairs in *candezei*, *ciliatus*, *guttifer*, and *spatulatus*. In some species (*gemmifer*, *guttifer*, *haafi*, *hemisphaericus*, *neuquen*, *pampeanus*, *pastillarius*, *peruanus*, and *spatulatus*) each middle tibia bears an acute tooth at the outer apical angle (fig. 17), whereas in the remaining species the angle is rounded off or is a right or obtuse angle; in *pedestris* the angle is acute but not truly tooth-like. The apex of the tibia, however, readily becomes worn, so that this character is not diagnostic in all cases.

## MALE GENITALIA

The majority of species, as is usual with *Trox*, can be identified by the male genitalia alone. The specific differences reside usually in the shape of the median lobe or even in the shape of the apex of this lobe. The median



lobe in the 25 species of the *brevicollis* and *bullatus* groups (figs. 50–89) is rather complex, because the dorsal portion surrounding the soft parts is an elongate, tongue-like, sclerotized sheath that assumes various bizarre shapes; it is even asymmetrical in a few species (*bifurcatus*, *brasiliensis*, *gemmifer*, *gemmingeri*, *pilularius*; figs. 54–56, 67–70). These intricacies are not visible in the median lobe of species of the *suberosus*, *batesi*, and *scaber* groups which appears as a more massive, undifferentiated piece (figs. 90–104). There are differences also in the shape or the juxtaposition of the lateral lobes. All the species, except for *scaber* (figs. 103, 104), have the basal piece (or phallobase or gonocoxite) very small in comparison with the length of the lobes. The inner sac of South American species was not examined.

The only species between which I could find no genitalic differences are *pilularius* and *brasiliensis*, and *seymourensis* and *galapagoensis*.

The only species in which the sex can be determined without dissection is *persuberosus*; males of this species have very dense hairs along the inner apical half of the hind tibiae, whereas females have only sparse hairs.

### DISTRIBUTION

The species of *Trox* are virtually world wide in distribution, as is stated above. Unfortunately, for some regions, such as Australia, one cannot generalize, because almost all examples in collections have insufficient locality data, usually merely "Australia," and also because too few specimens are known. According to Haaf (1954b, p. 692), the majority of species of *Trox* in Australia (about 40) probably inhabit the eastern part, with only a few species occurring in the northwest.

In Africa (Haaf, various papers), the majority of the 60-odd species occur in the southern part of the continent, a few in east Africa only, or in east Africa and Arabia, three or four range from Abyssinia to southern Africa, and two (*squalidus* and *melancholicus*) occur over the entire continent from Eritrea and Senegal to the Cape. There are two species on the island of Madagascar (*perrieri* and *niloticus*) of which one occurs also elsewhere. One species from South

Africa (*rhyparoides*) is found also on the oceanic island of St. Helena.

The Oriental Region has fewer species (14), about half of which occur in India; the others are from China, Indochina, Burma, Siam, and from the large islands of Java, Sumatra, Ceylon, Formosa, Hainan, and Luzon.

In the Palearctic Region (Balthasar, 1936), of 27 species, nine occur in continental Europe and North Africa (also the islands of Sardinia, Corsica, Cyprus, and the Canaries), and more than a dozen in Asia, in Ussuriland, Siberia, Mongolia, Japan, China, the Caucasus, Transbaicalia, and Turkestan; the remaining four species (*cadaverinus*, *hispidus*, *sabulosus*, and *scaber*) are widely distributed throughout Eurasia.

In the Western Hemisphere, most of the 75 species are found in northern Mexico and the southwestern United States, and in southern South America. Three species (*loxus*, *scaber*, and *suberosus*) occur in both North and South America. There is a marked gap in the distribution in the New World, for in the area from about latitude 15° N. (Guatemala) south through Central America to the equator (southern Colombia, northern Brazil), there are virtually no species of *Trox*. Except for the ubiquitous *suberosus* (Canada to southern Argentina) there are no records of the genus from Colombia, Venezuela, or the Guianas, or from British Honduras and El Salvador; including *suberosus*, only two species are found in Nicaragua, three in Guatemala, and three in the Antilles. Not even *suberosus* has been reported from Surinam, Panama, Costa Rica, or Honduras. To the north and south of this region, in which species of *Trox* are virtually absent, the number of species increases progressively, to decrease again in the north, as in Canada. This abundance of species in certain regions is probably governed by suitable biotope rather than by latitude. Thus, relatively arid, wide-open places with sparse vegetation appear to be preferred by species of *Trox*, such as the pampas of Argentina and Chile, the plateaus or chacos of Bolivia, Paraguay, and northern Mexico, the semi-desert areas of the southwestern United States, and the semi-barren Galapagos, whereas very humid, wet, or densely forested regions, such as western Canada, southern Mexico, Central America, and northern South America, are less suitable.

However, some species evidently prefer trees to treeless areas, as they breed in the nests of hole-nesting birds.

In South America, 29 of the 35 species occur in the extreme south, in Argentina or Chile, and 16 of these spread also northward to parts of Brazil, Paraguay, Bolivia, Peru, and Ecuador. Six additional species (*brasiliensis*, *ecuadorensis*, *galapagoensis*, *sallei*, *seymourensis*, and *tenebrosus*) are found north of Argentina and Chile, two being restricted to the Galapagos Islands. Three species (*chilensis*, *diffluens*, and *longitarsis*) appear to be restricted to Chile (from Santiago and Concepcion in central Chile to Osorno and Fonck in the southwest), and five to Argentina (*candezei*, *haafi*, *pampeanus*, *pedestris*, and *spatulatus*). (See table 1.)

TABLE 1  
GEOGRAPHIC DISTRIBUTION OF THE SPECIES OF *Trox* IN SOUTH AMERICA, WITH  
THE COUNTRIES LISTED FROM SOUTH TO NORTH

	Chile	Argentina	Uruguay	Brazil	Paraguay	Bolivia	Peru	Ecuador	Colombia	Venezuela	British Guiana	Surinam	French Guiana
<i>aeger</i> Guérin	x	x	x	x	x	—	x	—	—	—	—	—	—
<i>aricensis</i> Gutiérrez	x	x	—	—	—	x	x	—	—	—	—	—	—
<i>batesi</i> Harold	—	x	—	x	x	—	—	—	—	—	—	—	—
<i>bifurcatus</i> Vaurie, new species	—	x	—	x	x	x	—	—	—	—	—	—	—
<i>borrei</i> Harold	—	x	x	x	x	x	—	—	—	—	—	—	—
<i>brasiliensis</i> Vaurie, new species	—	—	—	x	x	—	—	—	—	—	—	—	—
<i>brevicollis</i> Eschscholtz	x	x	—	x	—	—	x	—	—	—	—	—	—
<i>bullatus</i> Curtis	x	x	x	—	—	x	x	—	—	—	—	—	—
<i>candezei</i> Harold	—	x	—	—	—	—	—	—	—	—	—	—	—
<i>chilensis</i> Harold	x	—	—	—	—	—	—	—	—	—	—	—	—
<i>ciliatus</i> Blanchard	—	x	—	—	—	x	—	—	—	—	—	—	—
<i>diffluens</i> Vaurie, new species	x	—	—	—	—	—	—	—	—	—	—	—	—
<i>ecuadorensis</i> Vaurie, new species	—	—	—	—	—	—	—	x	—	—	—	—	—
<i>galapagoensis</i> Van Dyke	—	—	—	—	—	—	—	x	—	—	—	—	—
<i>gemmifer</i> Blanchard	x	x	—	x	—	—	—	—	—	—	—	—	—
<i>gemmingeri</i> Harold	—	x	x	x	x	x	x	—	—	—	—	—	—
<i>guttifer</i> Harold	x	x	—	—	—	—	—	—	—	—	—	—	—
<i>haafi</i> Vaurie, new species	—	x	—	—	—	—	—	—	—	—	—	—	—
<i>hemisphaericus</i> Burmeister	x	x	—	—	—	—	—	—	—	—	—	—	—
<i>longitarsis</i> Harold	x	—	—	—	—	—	—	—	—	—	—	—	—
<i>loxus</i> Vaurie	—	x	—	x	—	—	—	—	—	—	—	—	—
<i>neuquen</i> Vaurie, new species	x	x	—	—	—	—	—	—	—	—	—	—	—
<i>pampeanus</i> Burmeister	—	x	—	—	—	—	—	—	—	—	—	—	—
<i>pastillarius</i> Blanchard	x	x	—	—	—	x	—	—	—	—	—	—	—
<i>patagonicus</i> Blanchard	—	x	—	x	—	—	—	—	—	—	—	—	—
<i>pedestris</i> Harold	—	x	—	—	—	—	—	—	—	—	—	—	—
<i>persuberosus</i> Vaurie, new species	—	x	x	x	x	x	x	—	—	—	—	—	—
<i>peruanus</i> Erichson	x	x	—	—	—	x	x	—	—	—	—	—	—
<i>pilularius</i> Germar	x	x	x	x	x	x	—	—	—	—	—	—	—
<i>sallei</i> Harold	—	—	—	—	—	x	x	x	—	—	—	—	—
<i>scaber</i> Linnaeus	x	x	—	—	—	—	—	—	—	—	—	—	—
<i>seymourensis</i> Mutchler	—	—	—	—	—	—	—	x	—	—	—	—	—
<i>spatulatus</i> Vaurie, new species	—	x	—	—	—	—	—	—	—	—	—	—	—
<i>suberosus</i> Fabricius	x	x	x	x	x	x	x	x	x	x	x	—	x
<i>tenebrosus</i> Harold	—	—	—	—	—	—	—	x	—	—	—	—	—
Total	16	26	7	13	9	12	9	6	1	1	1	—	1

Some species are recorded from high altitudes (*aricensis* and *peruanus* from 13,000 feet on the plateau of Puna in Bolivia, *ecuadorensis* from Quito, Ecuador), and some are found in the hot lowlands near the sea (São Paulo, Bahia, and Rio de Janeiro in Brazil); others occur by the sea or on rivers in more temperate lowlands (Patagones, Buenos Aires, Bahia Blanca, and Rio Negro in Argentina).

### FLIGHTLESS SPECIES

The smallest flightless species are 10 or 12 mm. long and the largest, from Australia, are 26 mm. These species form about one-sixth of the total number of *Trox*, and they occur on all the continents (except continental Europe) as well as (one species) on the Galapagos. In the Western Hemisphere, north of Guatemala, only four of the 43 species are flightless (*nodosus* LeConte and *texanus* Say, with somewhat reduced wings, and *scutellaris* Say and *umbonatus* LeConte with quite vestigial wings of only about 1 mm. in width), whereas of the 35 species in South America a higher percentage is flightless, three species (*batesi*, *galapagoensis*, and *tenebrosus*) having reduced wings, and six species having vestigial wings (*bullatus*, *hemisphaericus*, *pampeanus*, *pastillarius*, *patagonicus*, and *spatulatus*).

In the Eastern Hemisphere, according to Haaf (1954a, 1954b, 1957a, 1957b), of 39 Australian species, four are short-winged (*elongatus*, *marshalli*, *ovalis*, and *tasmanicus*), and seven have vestigial wings (*dohrni*, *elderi*, *gigas*, *granuliceps*, *regalis*, *rotundulus*, and *tatei*).

In Africa, of about 56 species, eight are probably flightless, "*Schulterbeule fast vollständig fehlend*" (Haaf, 1954a); these species are *baccatus*, *borgognoi*, *brincki*, *discedens*, *expansus*, *foveolatus*, *freyi*, and *varicosus*.

In the Oriental Region, two (*testudo* and *omacanthus* from India) of the 14 species lack full wings.

Although the majority of these species have a restricted geographic range, as would be expected, some members of the same species have been collected hundreds of miles apart: *batesi* from Amazonas in northern Brazil to Rio de Janeiro in the east and to the Chaco in Paraguay and northern Argentina (fig. 49); *bullatus* and *pastillarius* from Peru (only one specimen of each) to southern Argentina and

Chile (figs. 34, 49); *patagonicus* from Para in northern Brazil (one specimen) to southern Argentina (fig. 34); and *umbonatus* and *scutellaris* from Utah to Mexico City or from Utah to Nuevo Leon in northeastern Mexico. Unfortunately, we seldom have adequate series of individuals to determine whether the species is established in a certain locality or merely fortuitous. We also lack pertinent ecological information that might explain how these beetles travel so far without the ability to fly. Except for the small *batesi*, the species mentioned above are large (14 to 20 mm.) and could scarcely be carried by wind or by birds. A number of species of *Trox* have been taken in sand by the sea, and they possibly have been transported up and down rivers and along the coast; the river systems in South America penetrate far inland. Except for the chain of the Andes, there are not many geographical barriers against insects, and much of the land in South America is less than 1000 feet in altitude.

### HABITS

There is little information on the ecology of the South American species. In fact, according to Ritcher (1958, p. 321), although the life cycles of many scarabaeids have been worked out in detail, "... those of such subfamilies as Aphodiinae, Troginae, and Acanthocerinae are little known." Some situations in which individual beetles have been captured, however, are the same in South America as in other parts of the world, such as under carcasses of dead animals, on feathers, hairs, wool, bones, and malt, on sand dunes or in sandy places, and in flight at night. Any dead dried animal matter is apparently attractive to *Trox*. Both adults and larvae are found in the soil under carrion (Ritcher, *loc. cit.*). Some species are found in nests of birds or mammals in some parts of the world, and in South America *Trox scaber* has been taken from the nest of a hawk (*Buteo*), as well as from the nests of other birds and of small rodents, where they feed on the hairs or feathers in the nests. Conil (1880, pp. 237-238) said he had seen various specimens of *Trox* in Argentina enter holes in the ground made by hordes of ovipositing grasshoppers (*Acridium paranense*), and he believed that the beetles destroyed large quantities of the eggs laid therein. Although

he gives the names of the species involved, too much reliance cannot be put on his words because he evidently confused *Trox* with some of the dung-rolling scarabs (Coprinae). Thus he describes "*Trox*" as rolling pills of dung, laying eggs, and receiving aid from a companion in rolling the dung—all in the manner and style of the French entomologist, Fabre, in his famous work on "*Scarabaeus*," the sacred beetle.

The only South American species for which I give any notes on habits are *aeger*, *candezei*, *ciliatus*, *guttifer*, *pastillarius*, *patagonicus*, *pilularius*, *scaber*, *seymourensis*, and *suberosus*.

Erwin Haaf (personal communication) says that he received from F. Zumpt of the South African Institute for Medical Research, 11 specimens of *Trox cyrtus* Haaf taken from the nests of the Cape Vulture (*Gyps coprotheres* Forster) on October 28, 1956, by W. Brauns, in the mountain range near Rustenburg-Transvaal. Haaf himself took several specimens of *Trox squamiger* Roth at light at the edge of the virgin rain forest on Mt. Meru in Tanganyika, and in January, 1960, many specimens of *Trox montanus* Kolbe on the slope of Mt. Kilimanjaro, Tanganyika, at 11,000 feet in altitude. Haaf says the beetles "were crowded along a very small path, mostly on 'Gewoll' of birds of prey" in the mountainous meadows. (See Vaurie, 1955, pp. 7-8, for biology of some species in other regions, and Ritcher, 1958, for general remarks.)

It is known that individuals of *Trox* may stridulate when handled, but there appears to be disagreement as to what and where is the stridulating organ. Blatchley's report (1910) of an elliptical plate with pearly reflections, quoted by Vaurie (1955, p. 8), was evidently taken from Leconte and Horn (1883, p. 247), but Sharp (1897, pp. 206-207) says that this is not at all the stridulating organ. Sharp states that the characteristic sound is made by the rubbing of two fine, sharply raised ridges situated on the penultimate dorsal segment (one on the front margin of the segment and one in front of the hind margin of the segment) against a fine, raised carina near the suture on the apical half of each elytron. I

have not been able to find this carina, which Sharp says is very slender and difficult to see, but he states that it makes the stridulating sound even when scratched with a knife edge.

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For the loan of specimens, I wish to thank the following persons and the institutions that they represent: Dr. J. Balfour-Browne, British Museum (Natural History); Mr. O. L. Cartwright, United States National Museum; Dr. P. J. Darlington, Jr., Museum of Comparative Zoölogy, Cambridge; Dr. K. Delkeskamp, Zoologisches Museum der Humboldt Universität, Berlin; Mr. Henry Dietrich, Cornell University, Ithaca; Dr. Elli Franz, Senckenbergische Naturforschende Gesellschaft, Frankfurt; Dr. Heinz Freude, Zoologische Staatssammlung, Munich; Dr. Erwin Haaf, Museum G. Frey, Munich; Dr. Henry Howden, Canadian National Collection, Ottawa; Mr. Hugh B. Leech, California Academy of Sciences, San Francisco; Dr. Antonio Martínez, Buenos Aires; Drs. Francisco Silverio Pereira and Frederico Lane, Secretaria da Agricultura, São Paulo; Drs. S. L. Tuxen and S. G. Larsson, Universitetets Zoologiske Museum, Copenhagen; Dr. Manuel J. Viana, Museo de Ciencias Naturales, Buenos Aires; Drs. A. Villiers, G. Colas, and A. Descarpentries, Muséum National d'Histoire Naturelle, Paris; and Mr. Rupert L. Wenzel, Chicago Natural History Museum.

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## SYSTEMATIC SECTION

### GENUS *TROX* FABRICIUS

*Trox* FABRICIUS, 1775, p. 31. Type: *Scarabaeus sabulosus* Linnaeus, by subsequent designation of Latreille, 1810.

*Phoberus* MACLEAY, 1819, p. 137. Type: *Trox horridus* Fabricius, by monotypy.

*Omorgus* ERICHSON, 1847, p. 111. Type: *Trox suberosus* Fabricius, by subsequent designation of Lacordaire, 1856.

*Chesas* BURMEISTER, 1876, p. 264. Type: *Trox pastillarius* Blanchard, by monotypy.

*Polynoncus* BURMEISTER, 1876, p. 264. Type not designated.

*Lagopelus* BURMEISTER, 1876, p. 265. Type: *Trox ciliatus* Blanchard, by monotypy.

*Megalotrox* BORRE, 1886, p. 59. Type not designated.

*Pseudotrox* ROBINSON, 1948, p. 1. Type: *Trox laticollis* LeConte, by monotypy.

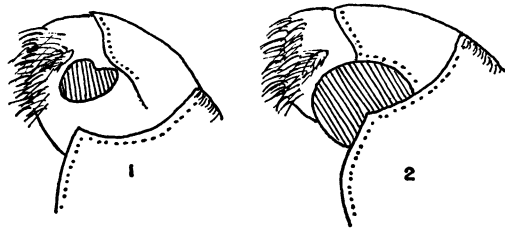
Contrary to the statement made by Vaurie (1955, p. 8) that three species were included by Fabricius in the genus, there were four, as *Trox horridus*, which appears in the appendix, was overlooked. One of the other species listed by Fabricius (1775, p. 31), *spinicornis* (no locality given), is no longer in the genus, but in *Acanthocerus*, according to Blackwelder (1944, p. 218). The date, however, is given as 1792 by Blackwelder, which is an error.

### SYNOPTIC TABLE OF GROUPS OF *Trox* IN SOUTH AMERICA IN ORDER OF TREATMENT

- A. Clypeus with apical portion bent down abruptly, perpendicular to disc of clypeus; male genitalia complex, median lobe usually very narrow and tongue-like (figs. 50-89).
  1. Eyes large and bulbous (fig. 2); inner wings normal and long, or slightly reduced but as long as elytra (*galapagoensis*, *tenebrosus*), therefore metasternum long, humeral calluses of elytra prominent, margins of elytra subparallel (fig. 3); 21 species . . . *brevicollis*
  2. Eyes small (fig. 1); inner wings virtually absent, therefore metasternum shorter than an abdominal segment, humeral calluses of elytra obsolete, flattened, margins of elytra more or less arcuate to apex and base; four species. . . . . *bullatus*
- B. Clypeus horizontal, apical portion on same level or same plane as disc (except for

*ciliatus*<sup>1</sup> in which it is both truncate and bent slightly); male genitalia simple, median lobe massive (figs. 90-104).

1. Scutellum sagittate, with sides angulate, or vaguely heart-shaped (figs. 5-7); eight species . . . . . *suberosus*
2. Scutellum U-shaped or shield-shaped (figs. 9, 10), sides subparallel.
  - a. Pronotum with hind angles distant from humeri of elytra; elytra with surface hairless; head bituberculate; male genitalia



FIGS. 1, 2. Eyes. 1. Small eyes of *bullatus* group and of *Trox pastillarius* and *spatulatus*. 2. Large, bulbous eyes of majority of species.

with basal piece smaller than lobes (fig. 102); one species . . . . . *batesi*

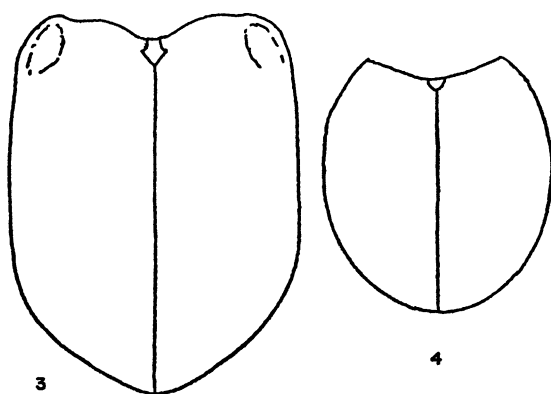
- b. Pronotum with hind angles resting on humeri of elytra; elytra with hairy tufts along intervals; head smooth; male genitalia with basal piece longer than lobes (figs. 103, 104); one species . . . . . *scaber*

### KEY TO THE SPECIES OF *Trox* IN SOUTH AMERICA

1. Elytra glabrous, without trace of tubercles or hairs, all intervals uniformly flat, of same width, lightly punctate, with rows of large punctures on each side; elytral margin not ciliate; clypeus with apex horizontal; length, 9 to 10 mm. . . . . *batesi*  
Elytra not glabrous (may be coated, tomentose, tuberculate, hairy, or costate); other characters various . . . . . 2
2. Occurring in Galapagos Islands. . . . . 3  
Occurring elsewhere than in the Galapagos . . . . . 5
3. Clypeus with triangular apex horizontal, on same level as head; pronotum with base angularly lobed at middle (fig. 15). . . . . *suberosus* (in part)  
Clypeus with triangular apex bent sharply

<sup>1</sup> This species differs from all others by having a distinct submarginal carina on the elytra from the humerus to the apex.

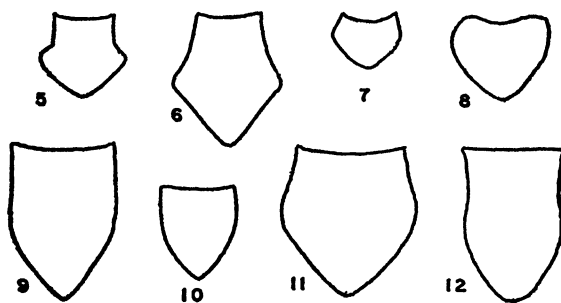
- downward; pronotum with base gently arcuate (fig. 16). . . . . 4
4. Elytra with humeral callus (umbone) bulbous, prominent, thus base of lateral margin not visible from above; inner principal rows with individual tubercles larger than punctures of striae, tubercles elongate and some of them, at least, distinctly separated longitudinally; southern islands. . . . . *seymourensis*
- Elytra with humeral callus obsolete, nearly flat, thus base of lateral margin visible from above; inner rows with individual tubercles no larger than punctures of striae, tubercles round, contiguous; northern islands. . . . . *galapagoensis*
5. Wings long, therefore metasternum at middle at least as long as second and third abdominal segments combined, its median disc as long as wide, and elytra elongate (fig. 3), with humeral callus large, convex, bulbous; scutellum usually longer than wide. . . . . 6



FIGS. 3, 4. Elytral shape. 3. *Trox suberosus*, fully winged. 4. *T. hemisphaericus*, wings lacking or vestigial.

- Wings vestigial or lacking, therefore metasternum at middle scarcely, if at all, longer than one abdominal segment, its median disc wider than long, elytra subcircular (fig. 4) or with humeral callus (umbone) lacking, or both, humerus flat (except for tubercles); scutellum usually not longer than wide . . . . . 31
6. Elytra with one or more sharp, entire, linear keels (carinae) on uniformly hairy but not tomentose surface; middle and hind tarsi and tibiae with long yellow hairs (on tarsi at least as long as each segment, on tibiae at least as long as tibiae are wide); scutellum sagittate (arrowhead shaped) (fig. 6) . . . . . 7

- Elytra not both carinate and hairy; middle and hind tarsi and tibiae with hairs, if present, either black or shorter than stated above; scutellum sagittate or not . . . . . 8
7. Each elytron with longitudinal, submarginal carina extending from lower edge of humeral callus to beyond middle of elytra; clypeus with front edge deflexed and truncate; 12 to 15 mm. . . . . *ciliatus*
- Each elytron with four (rarely three) longitudinal carinae on alternate intervals; clypeus with front edge horizontal, not deflexed; 9.5 to 10 mm. . . . . *candezzei*
8. Clypeus with front portion bent down sharply, its tip not at all visible when viewed from above; scutellum as in figures 9–12, not sagittate. . . . . 9
- Clypeus with front portion virtually horizontal, not bent down, its tip at least partially visible from above; scutellum (except in *scaber*) sagittate (figs. 5, 6). . . . . 27
9. Middle and hind tibiae with dorsal face



FIGS. 5–12. Scutellum shape, sagittate or hastate or arrowhead-shaped, heart-shaped, elongate or shield-shaped. 5. *Trox suberosus*. 6. *T. ciliatus*. 7. *T. pastillarius*. 8. *T. bullatus*. 9. *T. brevicollis*. 10. *T. batesi*. 11. *T. peruanus*. 12. *T. aeger*.

- smooth, flat, usually shining; shining parts of dorsum with hairs emerging from punctures . . . . . 10
- Middle and hind tibiae with dorsal face roughened, coated, punctured, or rugose; shining parts of dorsum, if present, not hairy . . . . . 11
10. Pronotum with basal margin gently arcuate, as in figure 16; clypeus with deflexed portion rounded in front; hind angles of pronotum sharp (fig. 30) . . . . . *pedestris*
- Pronotum with basal margin lobed or drawn backward toward scutellum as in figure 15; clypeus with deflexed portion acutely angulate; hind angles of pronotum rounded (fig. 33) . . . . . *diffuens*

11. Tubercles of elytra round and with tufts of distinct, coarse, dark setae emerging through grayish coating; clypeus with apex of deflexed portion bluntly angulate, almost rounded; pronotum with hind angles as in figure 28. . . . . *ecuadorensis*  
Tubercles of elytra of various shapes, and either bare or tomentose, but without setose tufts; clypeus with apex of deflexed portion sharply angulate (less sharp in *aeger*); pronotum various . . . . . 12
12. Elytra with large, overhanging humeral callus (fig. 20) that, seen from side, more or less obliterates basal lateral margin; Chile . . . . . 13  
Elytra with normal humeral callus that, seen from side, leaves basal lateral margin distinct; Chile or elsewhere. . . . . 14
13. Elytral disc with principal (ordinal) rows of large, strongly elevated, steep tubercles contrasting with intervening rows of tiny, roundish tubercles; subapical calluses of elytra large and overhanging . . . *chilensis*  
Elytral disc with all intervals except for third with small, scarcely elevated, flattish tubercles of about same size; subapical calluses of elytra gently rounded, not overhanging . . . . . *longitarsis* (in part)  
Species with combination of red hairs on scape (first antennal segment), elytra with very narrow, elongate, bare, punctate tubercles (as narrow as front tarsi), and, in male, hind tarsi virtually as long as hind tibiae . . . . . *longitarsis* (in part)  
Species not exactly as stated above . . . 15
15. Elytra with tubercles in form of flattish, round (or somewhat elongate), virtually impunctate, shiny, black plaques (figs. 13, 14); pronotum, viewed from above, with side margins near base usually no more than slightly, if at all, sinuate (figs. 21-24, 42) . . . . . 16  
Elytra with tubercles strongly convex, or elongate, or tomentose, or punctate; pronotum, viewed from above, with side margins near base usually distinctly emarginate or excised (figs. 26, 27). . . . . 23
16. Pronotum with all elevations bare and impunctate, innermost basal tubercles merged (confluent) horizontally across base (figs. 23, 24); propisternum coarsely setose . . . . . *guttifer*  
Pronotum with elevations, if present, either coated (encrusted) or punctate, innermost basal tubercles, if present, widely separated, and vertical or oblique; propisternum setose or not. . . . . 17
17. Even elytral intervals (2, 4, 6) between four principal rows of tubercles with single longitudinal rows of quite regularly spaced tubercles. . . . . 18  
Even elytral intervals between four principal rows with sinuous rows of tubercles, or with many irregularly spaced smaller tubercles in curving patterns as in figure 13 of *gemmifer*. . . . . 19
18. Each elytron with nine rows of bare tubercles (including those of suture); pronotum with median ridges divergent behind, their bases close to or touching apices of innermost basal tubercles (fig. 21); male genitalia as in figures 50 and 51 . . . . . *brevicollis*  
Each elytron with short, keel-like tenth row of contiguous tubercles (bare or coated) near base (fig. 14); pronotum with median ridges nearly convergent behind, their bases well separated from apices of innermost basal tubercles (fig. 22); male genitalia as in figures 52 and 53 . . . . . *aeger* (in part)
19. Pronotum shining, bare, not encrusted (but may have mud within punctures), sculpture of pronotum weak, with ridges and tubercles rather obsolete . . . . . 20  
Pronotum covered with buffy encrustation; if coat worn bare, then sculpture strong, with distinctly elevated ridges and tubercles . . . . . 21
20. Disk of pronotum uniformly punctate, without depressions; epipleura of elytron (ventral view) with outer edge crenulate (fig. 18); middle tibia with outer apex strongly toothed; clypeus with front margin sharply, angularly bent down, its disc concave; male genitalia as in figures 62-64 . . . . . *peruanus*  
Disc of pronotum with two small triangular depressions; epipleura of elytron with edge smooth, though ciliate; middle tibia with outer apex somewhat angulate but not toothed; clypeus with front margin rather broadly rolled down, its disc flat or but slightly concave; male genitalia split apically (figs. 65, 66). . . . . *aricensis*
21. Antennal and buccal hairs red; pronotum with lateral margins distinctly crenulate; male genitalia as in figures 58, 59 . . . *neuquen*  
Antennal and buccal hairs black; pronotum with lateral margins nearly smooth . . . 22
22. Male genitalia as in figures 54-56; propisternum not setose; pronotum with base lobed at middle as in figure 15 of *suberosus*, lateral margins entire, not excised . . . . . *gemmifer*  
Male genitalia as in figures 57 and 59; propisternum setose (not always visible); pronotum with base uniformly gently

- arcuate, lateral margins slightly excised in front of hind angles . . . . . *haafi*
23. Hairs of scape (first antennal segment) and of legs black; scutellum broad, only slightly longer than wide, as in figure 11 of *peruanus* . . . . . *pilularius*  
Hairs of scape and legs red or yellow; scutellum elongate, about twice as long as wide . . . . . 24
24. Pronotal sides with abrupt, bulging lobe at middle (fig. 26); elytra, in general, with only four or five tubercles on each row from base to subapical callus; small (8 to 9 mm.); male genitalia with two "tongues" on median lobe (fig. 77) . . . . . *bifurcatus*  
Pronotal sides gently arcuate at middle (fig. 27); elytra, in general, with at least six, often 10 or more, tubercles from base to subapical callus; larger (9 to 13 mm.); male genitalia with only one "tongue" . . . . . 25
25. Each elytron at base between fourth principal row of tubercles and margin with short carina of fused tubercles (fig. 14); tubercles of principal rows impunctate, or virtually so, drop-shaped, elongate (some five times longer than wide); male genitalia as in figures 67-69 . . . . . *brasiliensis*  
Each elytron at base without carina; tubercles of principal rows distinctly punctate, mostly round but some (in front) elongate; male genitalia as in figures 69, 70, 73, and 76 . . . . . 26
26. Elytra with tubercles of principal rows large, markedly elevated, nearly round, some, at least, as wide as scutellum; 9 to 12 mm.; male genitalia as in figures 69 and 70 . . . . . *gemmingeri*  
Elytra with tubercles of principal rows smaller, less elevated, usually elongate, much narrower than scutellum; 12 to 13 mm.; male genitalia as in figures 73 and 76 . . . . . *sallei*
27. Scutellum elongate, sides parallel from base to near apex; head punctate or hairy, not tuberculate; 5 to 7 mm. . . . . *scaber*  
Scutellum scarcely longer than wide, sides angulate at middle and constricted near base (sagittate); head bituberculate . . . . . 28
28. Middle tibia serrate on outer edge (four or five teeth); elytra with bare tubercles present on even intervals (2, 4, 6, 8, 10), odd intervals narrow, costate, tomentose . . . . . *borrei*  
Middle tibia with outer edge smooth; elytra with bare tubercles, if present, on odd intervals (suture, 3, 5, 7, 9), even intervals tomentose . . . . . 29
29. Pronotum with sides obtusely angulate behind middle, thence oblique to base (fig. 39) . . . . . *loxus*
- Pronotum with sides strongly excised behind middle, forming rather acute, lobed angles at base (fig. 43) . . . . . 30
30. Length, 9 to 14 mm.; middle tibia entirely covered with tomentose, felt-like coating; male genitalia as in figure 90 . . . . . *suberosus* (in part)  
Length, 14 to 17 mm.; middle tibia with inner basal half black, shiny, denuded (fig. 38); male genitalia as in figures 91 and 92. . . . . *persuberosus*
31. Elytral tubercles of four principal rows crowned with a dozen or fewer stiff, dark bristles . . . . . *tenebrosus*  
Elytral tubercles glabrous, shining. . . . . 32
32. Clypeus with triangular apical portion horizontal, on same level or plane as head, its tip visible from above . . . . . 33  
Clypeus with triangular apical portion bent sharply down or under, its tip not visible from above . . . . . 34
33. Legs coated, encrusted; front tibia with outer apical projection lobed (figs. 44-46); middle tibia with apical spurs of normal length . . . . . *pastillarius*  
Legs bare, black; front tibia with outer apical projection elongate and spatulate (figs. 47, 48); middle tibia with apical spurs as long as first three segments of tarsi . . . . . *spatulatus*
34. Elytra subcircular, nearly as wide as long, sides arcuate (fig. 4); proepisternum and epipleura with abundant, stiff hairs nearly as long as tarsal claws . . . . . *hemisphaericus*  
Elytra elongate, distinctly longer than wide, sides subparallel; proepisternum and epipleura minutely hairy or hairless . . . . . 35
35. Humeral angle of elytra and outer apex of middle tibia each with acute, projecting tooth (figs. 17, 19); smaller, 11.5 to 14 mm. . . . . *pampeanus*  
Humeral angle of elytra and outer apex of middle tibia merely obtuse; larger, 14 to 22 mm. . . . . 36
36. Chile and elsewhere; male genitalia with median lobe emarginate at apex; clypeus with deflexed apex acute, and front, seen from above, shallowly emarginate (fig. 35); pronotal pattern usually as in figure 31 . . . . . *bullatus*  
Not in Chile; male with median lobe sinuate at apex; clypeus with deflexed apex rounded, and front, from above, truncate (fig. 36); pronotal pattern usually as in figure 32. . . . . *patagonicus*
- SPECIES GROUP *brevicollis*
- CHARACTERS: Wings long (except for those of *galapagoensis* and *tenebrosus*). Head bitu-

berculate, tubercles elongate and subparallel, but often worn or covered with coating so that only rounded summits show. Clypeus at apex deflexed perpendicularly. Clypeal suture not visible owing to coating, two lateral pits present in front of tubercles of head. Eyes large and bulbous (fig. 2). Elytra with humeral calluses prominent (but not in *galapagoensis* and *tenebrosus*), stria punctures usually obscured by coating. Metasternal depression at least as long as second and third abdominal segments combined (somewhat shorter in *galapagoensis* and *tenebrosus*). Genitalia of male symmetrical in most species, but median lobe asymmetrical in *gemmifer*, *gemmingeri*, *pilularius*, *bifurcatus*, and *brasiliensis*.

This is the largest species group of South American *Trox*. It could, of course, be subdivided if smaller units were necessary. It is the same as Haaf's "*brevicollis*-Gruppe" in his provisional key to world groups (1953, p. 312). The group includes two short-winged forms and could also include the four forms with vestigial wings that I place in the *bullatus* group.

The first eight species have the elytral tubercles bare and impunctate, and the margins of the pronotum not or scarcely emarginate in front of the hind angles. The next 12 species have the elytral tubercles bare and distinctly punctate, or tomentose (coated) or setose, and the margins of the pronotum usually distinctly excised in front of the hind angles. The last species has the elytral tubercles tomentose and setose and the margins of the pronotum not at all emarginate.

#### *Trox brevicollis* Eschscholtz

Figures 9, 21, 50, 51

*Trox brevicollis* ESCHSCHOLTZ, 1822, p. 11, Concepcion [Concepcion], Chile; type not located.

*Trox lachrymosus* CURTIS, 1845, p. 455, Valparaiso, Chile; type in British Museum, examined.

**DIAGNOSIS:** Very similar to *aeger* and often confused with it in collections. The two species can be distinguished, aside from the distinctly different male genitalia, by the absence in *brevicollis* of a short, additional, half row of contiguous tubercles at the base of the sides of the elytra, which is characteristic of *aeger* (fig. 14). Most, but not all, specimens of

*brevicollis* have black, not red, antennal hairs, and it has the deflexed part of the clypeus longer than does *aeger*. Slight differences are present also in the pronotal pattern and in the shape of the scutellum.

**RANGE:** Brazil, Peru, Argentina, and Chile. (For data on the 145 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12 to 13.5 mm. Wings long. Male genitalia (figs. 50, 51) specifically distinct. Dorsum coated except for elevated parts of pronotum and elytra.

Clypeus with apical deflexed portion triangular, outline of front edge, seen from above, shallowly emarginate. Antennae with funicle inserted rather near apex of scape, scape black, hairs of scape mostly black but mixed with red or yellow in some specimens. Pronotum with elevated bare pattern as in figure 21; ridges and tubercles punctate; base drawn backward in obtuse lobe; sides gently widening to hind angles which are rounded off at obtuse angle, some specimens with a slight sinuation of sides in front of hind angles; sides of base oblique; margins with tiny hairs. Scutellum nearly twice as long as wide (fig. 9), sides parallel to middle, thence convergent to apex, not angularly lobed at middle. Elytra on each side with four rows of large (not so large as scutellum), bare, strongly elevated, round or elongate, apparently impunctate tubercles; suture and intervals between principal rows with smaller tubercles; remainder of elytra with yellow or grayish coating; margin smooth, with scarcely visible ciliae; marginal interval with row of small, bare tubercles near edge, appearing as mere spicules when coating is thick. Proepisternum ciliate on outer edge, disc not setose, inner front edge with long hairs. Tibiae usually with dark gray coating, but often worn smooth. Middle and hind tibiae setose, their outer edges appearing serrate owing to small setose tubercles; inner edges with short hairs. Middle tibia with outer apical angle obtusely angled, but not toothed. Front tibia with submedian outer tooth. Hind tarsus about three-fourths of length of tibia.

**REMARKS:** This species is apparently very common in Chile, whereas the dorsally quite similar *aeger* seems to be more common in



Argentina and southern Brazil. The character used by previous authors to distinguish these two species is the pattern of the pronotum which, in *brevicollis*, has the median ridges much farther apart than in *aeger* and touching the innermost basal tubercles (figs. 21, 22). The median lobe of the male genitalia is entirely different in shape in the two species (figs. 50–53). The apex of the lobe of *brevicollis* is dorsally of the same triangular shape as that of *aricensis*, but it is not split down the center in *brevicollis*.

I have examined the type of *Trox lachrymosus* Curtis, which is a typical specimen of *brevicollis*, and I agree with Harold (1872, p. 145) that this name is synonymous with *brevicollis*.

#### *Trox aeger* Guérin

Figures 12, 14, 22, 52, 53

*Trox aeger* GUÉRIN, 1844, p. 85, Peru; type not located.

*Trox leprosus* BLANCHARD, 1846, p. 188, "trouvé à Maldonado et Montevideo" [Uruguay]; type not located.

**DIAGNOSIS:** Most similar to the preceding species (*brevicollis*), and differing from it as stated in the diagnosis of that species. A smaller species with the same kind of pronotum as *aeger* is *gemmifer*, which differs from *aeger*, in some specimens, by having the tubercles of the elytra larger, flatter, and fewer in a row, and in all specimens by having the deflexed part of the clypeus longer, more angulate, and bent sharply, not with the edge rolled over as is that of *aeger*.

**RANGE:** Brazil, Peru, Paraguay, Uruguay, Argentina, and Chile. (For data on the 53 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 13 to 15 mm. Wings long. Male genitalia specifically distinct (figs. 52, 53). Dorsum coated except for elevated parts of pronotum and elytra.

Clypeus with apical deflexed portion shorter, less angulate, and less sharply deflexed than that of *brevicollis*, outline of front more or less arcuate. Antennae like those of *brevicollis*, but scape and hairs reddish yellow in most specimens. Pronotum like that of *brevicollis* except for shape of elevated pattern (fig. 22). Scutellum like that of *brevicollis* except for apex which is rounded in many, but

not in all, specimens (fig. 12). Elytra like those of *brevicollis* except for an additional short row (of same length as humeral callus) of contiguous, small tubercles at base of tenth interval between posterior outer edge of callus and margin of elytra (fig. 14). Legs and propisternum like those of *brevicollis* except for uncoated tibiae and tarsi (but all specimens that were seen are quite worn).

**REMARKS:** As soon as the short basal carina of the elytra is recognized (fig. 14), this species can always be differentiated from *brevicollis*, even without reference to the differences in pronotal pattern.

Although usually larger than *gemmifer*, *aeger* is difficult to distinguish from that species, which it resembles in the short elytral carina just mentioned (the carina is not so marked in *gemmifer*), in the pronotal pattern, and in the absence of true tubercles on the marginal intervals of the elytra. The difference in the shape and angle of the clypeus is diagnostic, however, and specimens of *aeger* also appear to have the metasternum nearly flat, whereas specimens of *gemmifer* have it distinctly depressed. In *aeger* the antennal hairs and club are reddish in the majority of specimens, but black in the majority of *gemmifer*. The male genitalia of these two species (when the lateral lobes are closed) are more similar than those of *aeger* and *brevicollis*, but the median lobe is quite different (figs. 53, 56). One specimen of *aeger* from La Plata, Argentina, differs from other individuals, as well as from closely related species, by having the elytral tubercles distinctly punctate.

The form *leprosus* Blanchard, 1846, the type of which I have not been able to find, was synonymized by both Harold (1872) and Burmeister (1876).

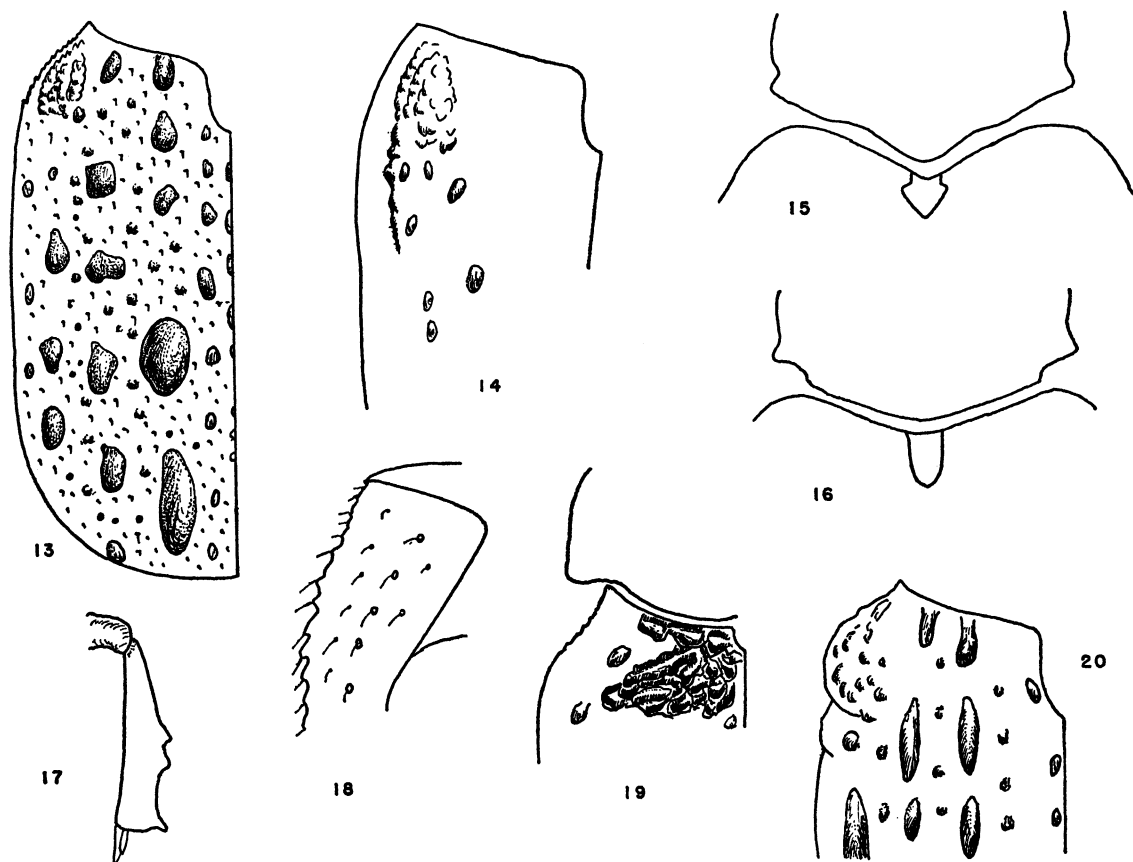
**HABITS:** According to Blanchard (for *leprosus*), this species is found on more or less dried carrion and often under animal cadavers. It was reported by Candèze (1870–1871) in shipments of wool from Buenos Aires to Belgium.

#### *Trox gemmifer* Blanchard

Figures 13, 17, 54–56

*Trox gemmiferus* BLANCHARD, 1846, p. 187, Patagonia [Argentina]; type not located.

*Trox argentinus* HAROLD, 1872, p. 143, "Cordova, Buenos Aires" [Argentina]; type, male, in Paris Museum, examined. New synonymy.



FIGS. 13–20. Body parts. 13. Left elytron, *Trox gemmifer*. 14. Left elytron, *T. aeger*, slightly inclined toward right side to show short basal carina; characteristic also of *T. brasiliensis*. 15. Lobed or “angular” base of pronotum, *T. suberosus*. 16. Gently arcuate base of pronotum, *T. seymourensis*. 17. Left middle tibia, *T. pampeanus*, showing toothed outer apical angle; characteristic also of *T. gemmifer*, *T. haafi*, and others. 18. Under side of base of right elytron, *T. peruanus*, showing crenulate margin. 19. Left elytron, *T. pampeanus*, showing humeral angle or tooth. 20. Left elytron, *T. chilensis*, showing overhanging humeral callus and elongate elytral tubercles. Figure 18 drawn to larger scale.

**DIAGNOSIS:** Differs from *aeger* and *brevicollis* and resembles *haafi* and *guttifer* by having the tubercles of the principal rows of the elytra generally flatter, and those on the intervals between the four principal rows often no larger than pin heads, and placed irregularly, not in straight rows. Differs further from *aeger* and *brevicollis* by having the outer apical angle of the middle tibia toothed.

**RANGE:** Argentina, Chile (one specimen), Brazil (one specimen). (For data on the 76 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 10 to 13 mm. Wings long. Male genitalia (figs. 54–56) specifically distinct. Dorsum coated except

for elevated parts of pronotum and elytra.

Clypeus, antennae, and pronotum like those of *brevicollis*, except for elevated pattern of pronotum which is like that of *aeger* (fig. 22), i.e., central ridges of pronotum convergent behind, basal tubercles not touching the ridges. Scutellum and elytra like those of *brevicollis*, except as stated in diagnosis above, and elytra, in some specimens, with faint indication of a short basal carina on tenth row at base. Proepisternum and legs like those of *brevicollis*, except for middle tibia which has outer apical angle toothed (fig. 17).

**REMARKS:** *Trox gemmifer*, *guttifer*, *haafi*, *neuquen*, *pastillarius*, and *spatulatus* all present the same general appearance of a buffy

crust or coat contrasting with black and impunctate, shining, generally flat, round elytral plaques or tubercles, the tubercles in some specimens being very large and few in number on a row. *Trox pastillarius* and *spatulatus*, however, are flightless and have a distinctive pronotal pattern from the others. *Trox guttifer* differs also in its pronotal pattern and by having the scutellum bare. *Trox neuquen* and *haafi* differ from *gemmifer* by having the base of the pronotum gently curved, not lobed as in most specimens of *gemmifer*. The curve of the base, however, is often obscured by the heavy encrustation, and furthermore the lobe in specimens of *gemmifer* is not always very pronounced; therefore, when males (with their distinctive genitalia) are not available, these three species are difficult to distinguish. In general, *gemmifer* differs externally from *neuquen* by lacking distinct crenulations on the sides of the pronotum, especially at the base (Blanchard said *gemmifer* had crenulations, but he may have had both species), and by having black antennal hairs, and the pronotal ridges and tubercles showing through the encrustation, not entirely covered as in *neuquen*. It differs from *haafi* by having less, if any, emargination in front of the hind angles of the pronotum. It differs from both species by having the tubercles of the fourth (submarginal) principal row of the elytra almost as large as those of the other principal rows, whereas they are smaller than the other rows in *haafi* and in *neuquen*, and by having no long setae on the disc of the proepisternum. Individuals of *gemmifer* vary in the number of tubercles on the principal rows, some having only four or five large ones (from the base of the elytra to the declivity), and some, such as the type of *argentinus*, having nine or 10.

The type of Harold's *argentinus*, as well as a few additional specimens discussed by Harold, has a dusky gray coating on the elytra instead of the usual buffy one (darkened by wear, perhaps), and they have more numerous and more elevated, not flat, elytral tubercles, but I believe they are all *gemmifer* and that *argentinus* is a synonym. The evidence is not conclusive, but the genitalia of the males (including those of the type of *argentinus*) agree with those of other males examined. Individual variation in the number

of tubercles per row occurs also in other species (*bifurcatus*, *gemmingeri*, *sallei*, and others).

***Trox haafi* Vaurie, new species**

Figures 17, 57, 59

TYPE MATERIAL: Type, male, "Golfe St. Georges, Coli-Huapi" [Comodoro Rivadavia, Argentina], 1903 (A. Tournouer), and one female paratype from Patagonia [Argentina], 1834 (d'Orbigny), in Oberthür collection, Paris Museum. One male paratype, Neuquen [Argentina], 1907 (A. Lendl), in Zoologisches Museum, Berlin; one female paratype, Rio Negro, Patagonia, Argentina, March to June, 1897 (H. de la Vaulx) in Frey Museum, Munich.

DIAGNOSIS: Externally scarcely distinguishable from *gemmifer*, but differing from it by having a setose proepisternum, an arcuate, not lobed, base on the pronotum, and a slight emargination of the sides of the pronotum in front of the hind angles. The species is similar also to *neuquen*, from which it differs by having the black ridges of the pronotum not entirely coated, the antennal hairs black, and the sides of the pronotum smooth, not crenulate. (See also remarks under *gemmifer*.) The male genitalia are distinct.

RANGE: Southern Argentina. In addition to the type and paratypes, two males with no locality data have been examined.

DESCRIPTION OF TYPE, MALE: (See description of group for characters omitted here). Length, 14 mm. Wings long. Male genitalia with median lobe specifically distinct, but genitalia when closed resembling those of *neuquen* (figs. 57, 59). Dorsum coated except for elevated parts of pronotum and elytra.

Clypeus and antennae like those described for *brevicollis*, except for outline of clypeus which is truncate. Pronotum with elevated pattern about as in *aeger* (fig. 22), but basal tubercles coated; base flatly curved without any lobe, sides widening gently to slight emargination in front of rounded hind angles, sides of base horizontal, margins with tiny ciliae. Scutellum about like that of *brevicollis*. Elytra like those of *brevicollis*, except for tubercles which are much larger and flatter and fewer in a row, and for greater contrast be-

tween tubercles of principal rows (some of which are as large as scutellum) and those of intervals between (some of which are no larger than pin heads and scarcely visible); scutellar and sutural area darkened; basal tubercles of submarginal row only one-fifth of size of those at middle of row and of those of other rows; margins slightly crenulate at base. Proepisternum setose on disc. Tibiae coated. Middle and hind tibiae with from five to six strong outer teeth. Middle tibia with outer apical angle toothed (fig. 17). Front tibia with two subapical teeth as well as four or five smaller basal teeth. Hind tarsus like that of *brevicollis*.

**VARIATIONS FROM TYPE:** The size varies from 8 to 15 mm. In two specimens the pronotum is nearly entirely coated so that only the angulate ridges at the apex show through the coating. In one of the paratypes the basal tubercles on the submarginal row of the elytra are scarcely visible. In two of the paratypes the tubercles at the base of the row between the suture and the first principal row are larger than the tubercles of the other intervals, probably because these tubercles are bare, whereas in the type the coating nearly covers the tubercles.

**REMARKS:** I name this species in honor of Dr. Erwin Haaf of the Frey Museum, Munich, for his valuable contributions to the knowledge of the *Trox* of Africa, Australia, and the Indo-Malay regions.

The large size of the type and of two of the paratypes and the darkened scutellar area make one think of specimens of *guttifer* at first glance, but the scutellum is not shining and not actually bare as it is in specimens of *guttifer*, the pronotum is not lobed at middle base, and the sutural tubercles are distinct, not confluent. The pronotal pattern differs also (see *guttifer*).

This species and *neuquen*, which follows, are so similar to *gemmifer* that there are, no doubt, many specimens of both species in collections that can be distinguished from *gemmifer* only by a dissection of the male genitalia. The genitalia in both *haafi* and *neuquen* have the apices expanded, whether viewed dorsally or in profile, and the sides of the apices concave, whereas in *gemmifer* the apex is scarcely widened and is flat. A quite different species with the same kind of genitalia as

*haafi* and *neuquen* is the flightless *hemisphaericus* (figs. 57–59, 89).

The type locality is the lake, Colhué Huapi, inland from the Golfo San Jorge, in the province of Comodoro Rivadavia, southern Argentina.

***Trox neuquen* Vaurie, new species**

Figures 58, 59

**TYPE MATERIAL:** Type, male, Neuquen [Argentina], 1907, A. Lendl,<sup>1</sup> collector, and one male paratype with same data in Zoologisches Museum, Berlin; one female paratype from Zapala, Neuquen, January, 1949, Monrós, collector, in collection of Antonio Martínez, Buenos Aires.

**DIAGNOSIS:** Very similar to *gemmifer* and *haafi* in general appearance and in the small pin-head size of the elytral tubercles and their irregular spacing among the four principal rows of tubercles, but differing from both species by having red, not black, antennal hairs, the sides of the pronotum partially or entirely crenulate, and the median lobe of the male genitalia of different shape.

**RANGE:** Southern Argentina and Chile. In addition to the type and paratypes, a third male, without locality, is in the American Museum of Natural History, and a female from Coquimbo, Chile, is in the collection of the Zoologisches Museum.

**DESCRIPTION OF TYPE, MALE:** (See description of group for characters omitted here). Length, 11.5. Wings long. Male genitalia with median lobe specifically distinct (fig. 58), but, when lateral lobes closed, genitalia resembling those of *haafi* and *hemisphaericus* (fig. 59). Dorsum coated except for elytral tubercles which are bare.

Clypeus like that of *brevicollis*, except for outline of front edge which is nearly truncate and wider than that of *brevicollis*. Antennae like those of *brevicollis*, but hairs and scape reddish. Pronotum with elevated pattern about like that of *aeger* (fig. 22), but ridges and tubercles flatter and entirely coated and punctate; base flatly curved; sides feebly, irregularly crenulate, widening gently without emargination to hind angles which are rounded-off right angles; sides of base hori-

<sup>1</sup> This name appears on various labels as L. Adolf or Dr. Lendl Adolf, but the correct name is Dr. Adolf Lendl.

zontal; margins with tiny hairs. Scutellum like that of *brevicollis* but with a feeble, basal, longitudinal keel dividing a depression. Elytra on each side with four principal rows of large (but not so large as scutellum), bare, flat, roundish, impunctate plaques, those of fourth row at base much smaller; sutural and other intervals between principal rows, as well as humeral callus and marginal interval, with tiny, pin-head-sized tubercles; remainder of elytra with buffy coating; margins in basal half crenulate, with tiny tubercles from which ciliae emerge. Proepisternum with disc setose. Tibiae coated. Middle and hind tibiae with from six to 10 teeth on their outer edges. Middle tibia with outer apical angle bluntly toothed. Front tibia with submedian outer tooth and three or more smaller basal teeth (all worn down). Hind tarsus like that of *brevicollis*.

**VARIATIONS FROM TYPE:** The length ranges from 11.5 to 13 mm. The sides of the pronotum, especially at base, are more noticeably crenulate in the male paratype and two other specimens than are those of the type, and this paratype has a suggestion of an emargination in front of the hind angles. The basal keel and depressions of the scutellum are much more distinct in two of the specimens because the coating on them is less thick. The setae of the proepisternum are not visible on two specimens. The tooth on the outer apical angle of the middle tibia and the teeth on the front tibiae are sharper, not so worn, in these specimens as are those of the type.

**REMARKS:** The enlarged, concave apex of the median lobe of the male genitalia is quite different from the narrow, flat aspect of that of *gemmifer* (figs. 56, 58); it is quite similar to that of *haafi*, but differs by having smaller expansions on the sides and by being round, not elongate, when viewed in profile. A third species with the apex concave on the sides is the flightless *hemisphaericus*.

*Trox neuquen* further resembles *haafi* and differs from *gemmifer* by having the disc and sides of the proepisternum setose (these setae, of course, are often worn off), the tubercles at the base of the fourth or submarginal row of the elytra much smaller than those at the middle of the row (in the type and male paratype of *neuquen* this fourth row at base is scarcely visible), and by having the base of

the pronotum rather flatly curved, not drawn backward into a lobe. The margins of the elytra at base are slightly crenulate in *neuquen* and *haafi*, but *neuquen* has less, if any, emargination in front of the hind angles of the pronotum, as is present in *haafi*.

Other species taken also at Neuquen are rather numerous: *brevicollis*, *ciliatus*, *gemmifer*, *guttifer*, *hemisphaericus*, and *pastillarius*.

### ***Trox guttifer* Harold**

Figures 23, 24, 60, 61

*Trox guttifer* HAROLD, 1868, p. 86, new name for *Trox gemmiferus* Blanchard, 1846, p. 188, "*Trox Porte-perles*," preoccupied by *Trox gemmiferus* Blanchard, 1846, p. 187, "*Trox Gemmifère*"; "*près le village de Patagones*," Patagonia [Argentina]; type of Blanchard's species not located.

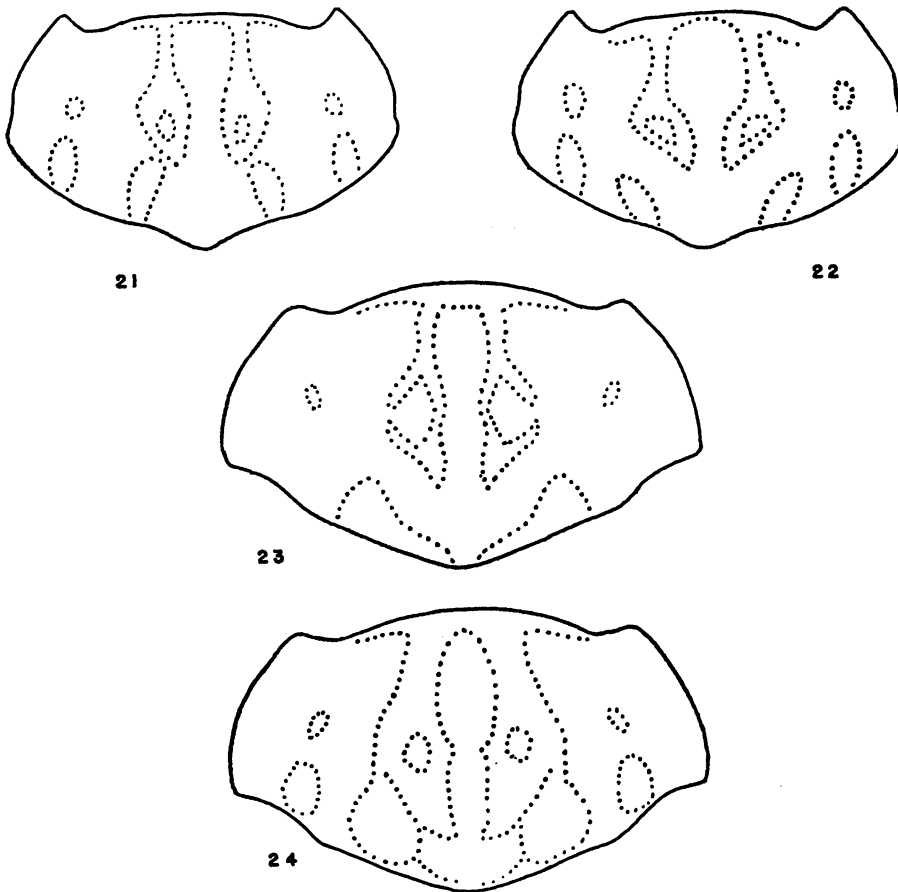
**DIAGNOSIS:** Differs from *aeger*, *brevicollis*, *gemmifer*, and other species with the pronotal sides not incised by having the bare elevations of the pronotum impunctate and usually very broad, the central ridges parallel on their inner sides, the basal tubercles merged and spreading along the base of the pronotum (figs. 23, 24), and by having the sutural tubercles of the elytra confluent. The elytral plaques are very large and flat, more like those of the flightless species *pastillarius*, and the scutellum is bare, without coating. The front tibiae are very broad, and all tibiae are strongly serrate.

**RANGE:** Argentina and (one specimen) Chile. (For data on the 43 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 13 to 14.5 mm. Wings long. Male genitalia with median lobe specifically distinct (figs. 60, 61), genitalia when closed resembling those of *pedestris* (fig. 78). Dorsum coated, except for elevated parts of pronotum and elytra.

Clypeus with apical deflexed portion shallowly triangular, outline of front (seen from above), broadly, shallowly emarginate or subtruncate. Antennae like those of *brevicollis*. Pronotum with elevated, bare pattern, as shown in figure 23 (when heavily coated), and in figure 24 (with less coating); ridges impunctate; remainder of pronotum like that of *brevicollis*, except for sides which are more strongly widened to base. Scutellum like that of *brevicollis*, but bare, not coated. Elytra on





FIGS. 21-24. Pronotal patterns. 21. *Trox brevicollis*. 22. *T. aeger*. 23. *T. guttifer*, typical. 24. *T. guttifer*, coating worn to expose more black areas.

each side with four rows of large (as large as or larger than scutellum), bare, mostly round, flattish, impunctate plaques; intervals between with smaller tubercles, some intervals (outer ones) with irregularly placed, minute tubercles; suture with elongate, confluent tubercles; area around scutellum with more tubercles than elsewhere; remainder of elytra like that of *brevicollis*. Proepisternum ciliate on outer edge, disc and inner front edge with very long hairs. Tibiae bare of coating. Middle and hind tibiae on outer edges strongly serrate, with five or six teeth and ciliate on inner edge (hairs of hind tibia as long as tibia is wide). Middle tibia with outer apical angle acutely toothed. Front tibia very wide, wider at its greatest width than apex of middle tibia, and with large subapical tooth and two

to four smaller basal teeth. Hind tarsus nearly as long as hind tibia.

REMARKS: Burmeister (1876, p. 261) considered *guttifer* a variety of *gemmifer* Blanchard, and both Arrow (1912), in the Junk catalogue, and Blackwelder (1944), in his catalogue, have followed Burmeister. They are two distinct species, however, as shown above in the diagnosis as well as in the figures of the male genitalia (figs. 60, 61). In fact, once its aspect is recognized, *guttifer* is one of the more readily identifiable species.

It is curious that Blanchard gave the same Latin name to two species only one page apart in his work (1846, pp. 187, 188), but perhaps he thought that the different vernacular names were sufficient.

HABITS: Blanchard said that this species

was found in high, dry, sandy places, in the day under animal carcasses, at night in flight.

***Trox peruanus* (Erichson)**

Figures 11, 18, 42, 62-64

*Omorgus peruanus* ERICHSON, 1847, p. 111, Peru; lectotype, male, here designated from three original syntypes in Zoologisches Museum, Berlin. GUTIÉRREZ, 1950, figs. 3, 5 (clypeus, genitalia).

**DIAGNOSIS:** Although the shape of the pronotum and scutellum, and the shining, flat tubercles of the elytra are about the same as those of specimens of *aricensis*, *peruanus* differs from that species by having the front of the clypeus, seen from above, very broadly emarginate or truncate, not narrowly emarginate, the deflexed part concave and longer, the outer apex of the middle tibia distinctly toothed, the tibia with more and larger teeth, the margins of the elytra slightly crenulate, not smooth, the male genitalia of different shape, and by being smaller. The pronotum lacks two little depressions characteristic of *aricensis*.

**RANGE:** Bolivia, Peru, Argentina, and Chile. (For data on the 64 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 11.5 to 13.5 mm. Wings long. Male genitalia specifically distinct (figs. 62-64). Dark gray coating present in depressed areas of elytra.

**DESCRIPTION OF LECTOTYPE, MALE:** Clypeus with apical deflexed portion triangular, outline of front, seen from above, broadly truncate, sides of front distinctly angulate, front margin as long as either side margin. Antennae like those of *brevicollis*, but hairs of scape black. Pronotum almost as long as one-half of elytra, surface densely punctate, median ridges and lateral tubercles virtually obsolete, only a faint, interrupted, elevated, median line present; base drawn backward in obtuse lobe; sides crenulate (fig. 42) and with short ciliae, widening to obtusely rounded hind angles; sides of base oblique. Scutellum less elongate than that of *brevicollis* (not longer than wide), sides converging to apex from middle of sides (fig. 11), base with longitudinal keel. Elytra like those of *brevicollis*, except for additional pin-point tubercles in intervals, crenulate margin (fig. 18), and marginal interval with more than one row of

tubercles. Proepisternum like that of *brevicollis*. Tibiae coated. Middle and hind tibiae with four or more distinct large teeth on outer edges, and long ciliae on inner edges. Middle tibia with outer apical angle acutely toothed, tooth as large as subapical tooth. Front tibia with submedian outer tooth and two or three smaller basal teeth worn to rounded swellings. Hind tarsus about three-quarters of length of hind tibia.

**VARIATIONS FROM LECTOTYPE:** Some individuals have the clypeus broadly emarginate instead of truncate, the center of the pronotum faintly depressed, the basal outline of the pronotum more distinctly lobed, the ciliae of the sides of the pronotum less worn, the scutellum slightly longer than wide, and the teeth of the front tibiae much larger and sharper.

**REMARKS:** In spite of the many differences given in the diagnosis above, old or worn specimens of *peruanus* and *aricensis*, if of aberrant size, may be difficult to differentiate. When males are available, however, the two species can be distinguished at once by a glance at the median lobes of the genitalia, those of *peruanus* consisting of a long, narrow tongue, but those of *aricensis* of a stout, longitudinally split triangle. A difference usually visible in both sexes is that most individuals of *aricensis* have a more deeply sculptured pronotum and two round or triangular depressions or "eyes" on each side of the center, whereas individuals of *peruanus* have no such "eyes," and the ridges and tubercles of the pronotum are flattened or merged, even becoming obsolete in some specimens.

***Trox aricensis* Gutiérrez**

Figures 65, 66

*Trox aricensis* GUTIÉRREZ, 1950, p. 63, figs. 4, 6, Putre, Arica [now Tarapaca], Chile; type, male, said to be in the collection of the author.

**DIAGNOSIS:** Very similar to but larger than *peruanus*, differing from it further as stated in the diagnosis and discussion of that species. These two species differ from *brevicollis*, *aeger*, and *guttifer* by having, in the intervals between the principal rows of the elytra, two sizes of irregularly spaced tubercles, one about one-fourth of the size of the principal tubercles, and one no larger than a pin point.

RANGE: Bolivia, Peru, Argentina, and Chile. (For data on the 36 specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 15 to 16 mm. Wings long. Male genitalia specifically distinct (figs. 65, 66). Dark gray coating present in depressed areas of elytra.

Clypeus with apical deflexed portion triangular, outline of front, seen from above, shallowly or deeply but narrowly emarginate, sides of front rounded off, front margin shorter than either side margin. Antennae and pronotum like those of *brevicollis* (fig. 21), except for the fact that punctures are evident in depressed areas of pronotum and that tubercles and ridges are obsolete in many specimens. Scutellum less elongate than that of *brevicollis*. Elytra and proepisternum like those of *brevicollis*, except for many additional pin-point tubercles on elytral intervals. Tibiae coated. Middle and hind tibiae with five or six or more sharp teeth on outer edges and long ciliae on inner edges. Middle tibia with outer apical angle sharp, but not actually toothed. Front tibia with large submedian tooth and four or five small basal teeth. Hind tarsus about three-quarters of length of hind tibia.

REMARKS: Although the figure of the male genitalia given by Gutiérrez (1950, p. 62) is not identical with my figure (fig. 65), I am sure that they are both but slightly different renderings. *Trox aricensis* is the only species in South America with the tip of the median lobe split longitudinally.

The difference in the outline of the front of the clypeus between this species (narrowly emarginate) and *peruanus* (broadly truncate) is shown by Gutiérrez (1950, figs. 3, 4), but I have seen one or two specimens that are rather intermediate in respect to this character.

Gutiérrez says that *aricensis* occurs at lower elevations (Putre, 3700 meters) than *peruanus* (Parinacota, 4300 meters) and that they have not been taken together, but I have seen five specimens of each species from Oroya, Peru, and both species from La Quiaca, Argentina, and from the plateau of Puna, Bolivia, at 13,000 feet, also at Oruro, Guaqui, and Vacas, Bolivia.

Four specimens from La Rioja, Argentina,

differ slightly from other specimens of *aricensis* by having the hairs on the antennal scape more dark red than black, by having the scutellum narrower and longer, and by having the center ridges of the pronotum more distinct and more elevated, not so flattened. The male genitalia, however, appear to be the same as those in other specimens.

#### *Trox pilularius* Germar

Figures 67-69

*Trox pilularius* GERMAR, 1824, p. 113, Buenos Aires [Argentina]; type probably in museum in Halle, Germany.

DIAGNOSIS: Pronotum almost identical with that of *gemmingeri* and resembling also that of *bifurcatus* and *brasiliensis*, but *pilularius* differs from these three species by having black hairs on the antennal scape and the scutellum broader and stouter. It resembles *gemmingeri* and differs from the other two species by having the elytral tubercles black and bare at their bases, but with gray or tan tomentosity on top. Both *pilularius* and *gemmingeri* have very large tubercular "buttons" on the marginal intervals of the elytra.

RANGE: Brazil, Bolivia, Paraguay, Uruguay, Argentina, and (one specimen) Chile. (For data on the 119 specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 10.5 to 13 mm. Wings long. Male genitalia like those of *brasiliensis* (figs. 67-69). Dorsum coated except for bases of elytral tubercles.

Clypeus and antennae like those of *brevicollis* except for black, not red, antennal hairs. Pronotal pattern of elevated, coated ridges and tubercles about like that of *brevicollis* (fig. 21), but each tubercle distinct, not merging with other elevated parts, and pattern bolder, more elevated; base drawn back in obtuse lobe; sides excised sharply in front of hind angles which form sharp little lobes; sides emarginate to base; margins with tiny hairs. Scutellum larger and broader than that of *brevicollis*, more shield-shaped. Elytra on each side with four rows of large (almost as large as scutellum), bulbous, roundish (on some rows elongate) tubercles; suture and other intervals with smaller tubercles, tubercles bare around base, but their crowns punctate and tomentose; margins smooth, with

scarcely visible ciliae; marginal interval with row of tubercles almost as large as tubercles of ninth row, those near apex of elytra overhanging the margin, making margin appear sinuous. Proepisternum and legs like those of *brevicollis*, except for outer tooth of front tibia which is subapical in some specimens.

REMARKS: The large marginal "buttons" on the elytra are visible to the naked eye, much as they are also in *gemmingeri*. The male genitalia are similar to those of *brasiliensis*, but that species has a quite different elytral pattern of elongate, entirely coated tubercles. The broad scutellum of *pilularius* resembles that present in both *peruanus* and *aricensis* (fig. 11), species with flat and shining tubercles on the elytra.

One specimen has the sides of the pronotum and the tubercles of the elytra so worn that it might be mistaken for a specimen of *brevicollis*, but *pilularius* invariably differs from that species by having large marginal tubercles on the elytra and the inner basal tubercles of the pronotum well separated, not touching the bases of the center ridges.

HABITS: This is one of the species reported by Candèze (1870–1871) in sheep's wool sent from Argentina to the factories of Belgium. Blanchard (1846) said it was found often in the ground under the bodies of dead animals.

#### *Trox gemmingeri* Harold

Figures 27, 69, 70

*Trox Gemmingeri* HAROLD, 1872, p. 134, Goyaz, Brazil; type in Paris Museum, examined.

DIAGNOSIS: Resembling *bifurcatus*, *sallei*, and *pilularius*, differing from the first two in the shape of the male genitalia, and from *bifurcatus* also in the outline of the sides of the pronotum (figs. 26, 27). It differs from *pilularius* by having red, not black, antennal hairs, a more elongate scutellum, and smaller tubercles on the marginal interval of the elytra.

RANGE: Brazil, Peru, Bolivia, Paraguay, Uruguay, and Argentina. (For data on the 86 specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 9 to 12 mm. Wings long. Male genitalia as shown in figures 69 and 70, median lobe specifically distinct. Dorsum entirely covered with coating.

Clypeus and antennae like those of *brevicollis*, except for hairs of scape which are red or

yellow. Pronotal pattern of elevated, coated ridges and tubercles about like that of *brevicollis* (fig. 21), but tubercles more strongly elevated and elevations coated, not bare; base drawn backward in obtuse lobe; sides widening gently toward rear and excised sharply in front of hind angles which form sharp little lobes; sides emarginate to base; margins with tiny hairs. Scutellum like that of *brevicollis*. Elytra on each side with four rows of large (in some specimens as large or as long as scutellum), bulbous, roundish (some elongate), tomentose, deeply punctate tubercles which, in some specimens, have bases bare and uncoated as in *pilularius*; suture and other intervals with smaller tubercles; margins smooth, with scarcely visible ciliae; marginal intervals either with row of large, tomentose tubercles that are as large as those of ninth row, or with row of much smaller tubercles. Proepisternum and legs like those of *brevicollis*, except for serrations on tibiae which are usually very small or not visible.

REMARKS: This species has not only been misidentified in many collections, but was misidentified by Harold himself, for there is a second specimen in the Oberthür collection (in Paris) in addition to the type, which is marked "*gemmingeri*" in Harold's writing, but which is actually another species (*brasiliensis*).

Some individuals, as is true also of some individuals of *gemmifer*, *sallei*, and allied species, have smaller, flatter, and more numerous tubercles on the rows of the elytra, and some, like the type of *gemmingeri*, have fewer but larger tubercles. Those with fewer tubercles resemble *bifurcatus* in respect to the elytra, and those with more tubercles resemble *sallei*. The genitalia of males of *gemmingeri* have a narrow, nearly straight tongue, with the apex truncate; otherwise the genitalia are similar to those of *brasiliensis* and *pilularius*.

Harold (1872, p. 135) said that both *gemmingeri* and *pilularius* were always identifiable by an apical swelling on the inner side of the front tibia. Some species described since the time of Harold (*bifurcatus*, *galapagoensis*, and *seymourensis*) appear to have this character also, at least in some individuals. In any case it is difficult to see this slight swelling because of hairs in the region and because of the usual position of the front legs.

***Trox bifurcatus* Vaurie, new species**

Figures 25, 26, 77

**TYPE MATERIAL:** Type, male, Province of Sara, eastern Bolivia, J. Steinbach, collector, in Zoologisches Museum, Berlin, and 18 paratypes from various parts of Bolivia: nine in the same institution, four in the United States National Museum, three in the American Museum of Natural History, one in the California Academy of Sciences, and one in the Frey Museum, Munich. (See Appendix for further locality data on paratypes and for the localities of 48 other specimens.)

**DIAGNOSIS:** This is one of the smallest of the South American species, and the male has unique forked genitalia. Dorsally, however, *bifurcatus* is scarcely distinguishable from some individuals of *gemmingeri* and *sallei*, except for the sides of the pronotum which in all specimens that I have seen have a large abrupt bulge in front of the basal lobes (fig. 26) in *bifurcatus*, which is not present, at least not markedly so, in the other species.

**RANGE:** Bolivia, Brazil, Paraguay, and northern Argentina (fig. 25).

**DESCRIPTION OF TYPE, MALE:** (See description of group for characters omitted here). Length, 8.5 mm. Wings long. Male genitalia specifically distinct (fig. 77). Dorsum entirely coated.

Clypeus and antennae like those of *brevicollis*, except for hairs and scape of antennae which are red. Pronotal pattern of elevated ridges and tubercles like that of *brevicollis* (fig. 21), but all parts more strongly elevated; base of pronotum drawn backward in obtuse lobe; sides bulbous, almost tubercular in front of middle (fig. 26), strongly emarginate in front of hind angles which form sharp little lobes; sides emarginate to base; margins with tiny hairs. Scutellum like that of *brevicollis*. Elytra on each side with four rows of from four to six tubercles from base to subapical declivity, tubercles large, bulbous, roundish or elongate (one tubercle as long as scutellum); on top, tubercles tomentose and punctate, at base, bare; suture and intervals between principal rows with much smaller tubercles; marginal interval with majority of tubercles as large as those of fourth principal row; margins smooth, with tiny ciliae. Proepisternum and legs like those of *brevicollis*,



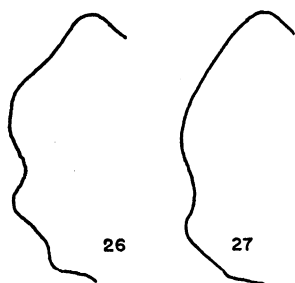
FIG. 25. Distribution of *Trox sellei* and *T. bifurcatus*.

except for serrations of tibiae which are very small, scarcely visible.

**VARIATIONS FROM TYPE:** The length varies from 8.5 to 9.5 mm. The bulging sides of the pronotum are more nearly at the middle of the sides in some specimens, and they may be almost angular in outline. The elytral tubercles in some specimens are even larger than the scutellum and their punctures may be obscured by the coating; they are few in number on each row, as in the type, and some specimens may have only three tubercles on the third principal row. Minute serrations are visible on the outer edges of the middle and hind tibiae in a few individuals, but the legs are usually covered with coating.

**REMARKS:** This apparently abundant species is often misidentified in collections as *gemmingeri*, *pilularius*, or *sallei*, none of which in the male has a tributary "tongue" branching off from the principal "tongue" of the median lobe of the genitalia (fig. 77). Ex-





FIGS. 26, 27. Lateral outline of pronotum. 26. *Trox bifurcatus*. 27. *T. gemmingeri*.

ternally *bifurcatus* differs from most specimens of the species mentioned by having fewer elytral tubercles in each principal row, generally four or five from the base of the elytra to the declivity, as against six or more in the other species. Some specimens of *gemmingeri* and *sallei* also have fewer tubercles, therefore the additional bulge on the pronotal sides in *bifurcatus* should be used for determination of the species. *Trox bifurcatus* differs further from *brasiliensis*, which occurs in some of the same localities in Brazil and Paraguay, by having the elytral tubercles more round, less elongate, and by lacking the short carina at the base of the tenth interval of the elytra. The range of *bifurcatus* (fig. 25) is about the same as that of *gemmingeri*, but it is more southern than that of *sallei*.

***Trox sallei* Harold**

Figures 25, 73, 76

*Trox Sallei* HAROLD, 1872, p. 138, Bolivia; type in Paris Museum, examined.

*Trox Ranavalo* PAULIAN, 1936, p. 134, pl. 10, fig. 8, "Madagascar?," probably error for South America; type in British Museum, examined. New synonymy.

**DIAGNOSIS:** Differs from the three preceding species (*pilularius*, *bifurcatus*, and *gemmingeri*) and resembles *seymourensis* from the Galapagos Islands by having the tomentose elytral tubercles generally elongate and narrow, not round; differs from *seymourensis* by having these tubercles widely spaced. Differs from all four species in the curving, knife-like blade of the median lobe of the genitalia. The species is most similar to *gemmingeri*, but generally larger.

**RANGE:** Bolivia, Peru, and Ecuador (fig.

25). (For data on the 50 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12 to 13 mm. Wings long. Male genitalia with median lobe specifically distinct, its blade being one-half of width of blade in *ecuadorensis* (figs. 73, 76). Dorsum entirely coated.

Clypeus and antennae like those of *brevicollis*, except for hairs and scape of antennae which are red. Pronotal pattern of elevated ridges and tubercles about like that of *brevicollis* (fig. 21), but elevations coated, not bare; base drawn backward in obtuse lobe; sides widening gently to basal emargination in front of hind angles which form sharp little lobes; sides of base slightly emarginate; margins with tiny hairs. Scutellum like that of *brevicollis*. Elytra on each side with four principal rows of small, elongate (some round), tomentose, punctate tubercles that are no wider than width of the row, tubercles separated longitudinally from one another in some specimens by length of each tubercle; suture and other intervals, including marginal ones, with smaller tubercles; margins smooth, with scarcely visible ciliae. Proepisternum and legs like those of *brevicollis*, but front tibia of some specimens with additional outer tooth.

**REMARKS:** Although Harold (1872, p. 138) knew no species with which *sallei* could be confused, a number of species are now known from which it differs externally only in small details. Of the species compared with *sallei* in the diagnosis above, *pilularius* differs further by having black, not red, antennal hairs and scape, and *bifurcatus*, by having an additional bulge on the sides of the pronotum (fig. 26), but *gemmingeri* is not always distinguishable unless the genitalia of males can be compared. Some individuals of *gemmingeri* have the elytral tubercles as elongate as in most specimens of *sallei*, and some individuals of *sallei* have them more or less round as in the majority of specimens of *gemmingeri*. The diagnostic, long, blade-like, median lobe of the genitalia of *sallei* is found elsewhere in South American species only in males of *ecuadorensis* and *tenebrosus*, in which species, however, it is nearly twice as broad as in *sallei* (figs. 73-76).

The type of *sallei* has somewhat less pronounced emargination in front of the hind

angles of the pronotum than that in many other specimens.

The type of *ranavalo*, which I have examined, is undoubtedly a typical specimen of *sallei*, and therefore *ranavalo* is a synonym. The locality, Madagascar, on the type label bears a question mark, and Haaf (*in litt.*) also questioned the locality because the type did not appear to him to be an African form.

***Trox seymourensis* Mutchler**

Figures 16, 71, 72

*Trox seymourensis* MUTCHLER, 1925, p. 229, South Seymour [Baltra] Island, Galapagos Islands; type in the American Museum of Natural History, examined.

**DIAGNOSIS:** Resembles strongly both *sallei* and *galapagoensis*, having similar head, pronotum, and general elytral pattern. The tubercles of the elytra, however, are closer together along the rows than are those in *sallei*, but they are not contiguous, as are those of *galapagoensis*.

**RANGE:** Southern islands of the Galapagos archipelago. (For data on the 75 specimens examined, see Appendix.) Abingdon [Pinta] Island is reported by Van Dyke (1953, p. 124).

**DESCRIPTION:** (See description of group for characters omitted here). Length, 9 to 12 mm. Wings long. Male genitalia like those of *galapagoensis*, but slightly smaller (figs. 71, 72). Dorsum entirely encrusted.

Clypeus and antennae like those of *brevicollis*, except for red hairs on red antennal scape. Pronotum with elevated, coated ridges and tubercles; median ridges slightly sinuate but in general nearly parallel, as wide as basal median tubercles into which they merge; lateral tubercles present; surface punctate, punctures of ridges smaller than those of depressed areas; base rather flatly curved; sides widened gently to hind angles which consist of small, rounded lobes formed by excision or emargination of sides; sides of base emarginate; margins with short hairs. Scutellum like that of *brevicollis*, but in some specimens its sides almost angulate at middle, as in figure 11 of *peruanus*. Elytra in clean specimens with large stria punctures visible, each elytron with four rows of strongly elevated, tomentose, mostly elongate, punctured tubercles, those on inner (next to suture) principal

row larger and closer together (separated longitudinally by width of an interval or less), suture with smaller, also dense, tubercles; intervals between principal rows with tiny tubercles, not more than spicules, and in many specimens not visible owing to heavy coating; margins with scarcely visible ciliae, marginal interval with tubercles as large as those of ninth row. Proepisternum, tibiae, and tarsi like those of *brevicollis*, except front tibia in some specimens has two or three additional outer teeth.

**REMARKS:** The only other species of *Trox* reported from the Galapagos archipelago are *galapagoensis* from the two northernmost islands (see diagnosis of that species for comparison), and *suberosus*, which has been taken in most of the same islands as *seymourensis*, but which is widespread in North and South America as well. *Trox suberosus* differs from *seymourensis* by having the scutellum as wide as long and angulate at the sides (fig. 5), the clypeus horizontal, not bent down sharply at the tip, the marginal interval of the elytra without tubercles, and the male genitalia of a very different type (fig. 90). The male genitalia of *sallei* (figs. 73, 76) from the mainland (Ecuador, Peru, and Bolivia) also differ widely from those of *seymourensis*.

I have seen specimens of *seymourensis* from five of the 20 islands, and *suberosus* from eight.

**HABITS:** Van Dyke (1953, p. 124) wrote that the "abundance of specimens from Villamil [Isla Isabela] can be accounted for by the fact that there was a settlement there and some slaughtering carried on."

***Trox galapagoensis* Van Dyke**

Figures 71, 72

*Trox galapagoensis* VAN DYKE, 1953, p. 124, pl. 6, fig. 7, Culpepper [Darwin] Island, Galapagos Islands; type, female, in the California Academy of Sciences, examined.

**DIAGNOSIS:** Differs from *seymourensis* only in the tubercles of the elytra and in the shortened wings, the latter condition causing further differences, such as broader, shorter elytra, no humeral callus on the elytra, and shorter scutellum and metasternum. The diagnostic elytra are covered, including the outer margins, with uniform rows of round, dense, tiny, crater-like, waxy tubercles re-

sembling the mud nests of wasps, each tubercle with a seta in it, whereas in *seymourensis* each elongate tubercle is much larger, has from two to six or seven setae, and the tubercles are not contiguous.

**RANGE:** The two most northern islands of the archipelago, Darwin (or Culpepper) and Wolf (or Wenman). (For data on the four specimens and one elytron examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 10 to 12 mm. Wings reduced to nearly one-half of normal length. Male genitalia like those of *seymourensis* (figs. 71, 72) but proportionately larger.

Clypeus and antennae like those of *brevicollis*, except for red hairs on red antennal scape. Pronotum as given for *seymourensis*. Scutellum like that of *brevicollis* but less elongate, only slightly longer than wide. Elytra with humeral callus obsolete, this area tuberculate but flat, margin and marginal interval at base of elytra plainly visible from above; subapical callus obsolete; striae punctures distinct, larger than tubercles of principal rows; all rows of elytra with uniform, tiny, round, tomentose tubercles, those on principal odd rows (3, 5, 7, and 9) more elevated and closer together (usually touching one another) than those on intervals between; margins with scarcely visible ciliae emerging from small tubercles that, being on the margin itself, make the margin appear crenulate. Proepisternum, tibiae, and tarsi like those of *brevicollis* except front tibia with additional outer tooth.

**REMARKS:** Possibly this form is conspecific with the fully winged *seymourensis* from the southern islands and may have lost its powers of flight in its isolation on Darwin and Wolf Islands, two of the smallest and most remote of the archipelago (75 miles north of Isabela and the southern islands). I believe, however, that these forms are probably separate species. The elytral pattern of the few specimens of *galapagoensis* I have examined (five) appears to be constantly different from that of 75 or more specimens of *seymourensis*; even a badly worn elytron of *galapagoensis*, with the normally tomentose tubercles appearing as a series of shining beads, has the diagnostic pattern of fresh specimens. The shape and in-

tricacies of the median lobe of the male genitalia are the same in both species (figs. 71, 72), but the size of the genitalia is proportionately larger in the smaller species (*galapagoensis*). As for the wings, although other Coleoptera have both normal and reduced wings in the same species, I know of no species of *Trox* of which this is true. In *Trox texanus* and *T. nodosus* from the southwestern United States and northern Mexico, the length of the shortened wing varies individually, but no specimens have been reported with normal full wings.

The inner wings, dissected by Van Dyke on his type, and by me on one of the other specimens, are fairly broad and have veins and pterostigma, but, as Van Dyke states (1953, p. 125), they are only about one-half of normal size, being no longer than the length of the elytra, whereas a normal wing is usually longer than the entire beetle. Although the metasternum, owing to this reduction of the wing, is shorter than it is in the fully winged *seymourensis*, it is not so short as it is in species like *bullatus* where the wings are truly vestigial. Van Dyke's figures of the elytra of the two Galapagos species do not show the difference in the humeral callus, which is obsolete and flattened in *galapagoensis*, but in *seymourensis* is prominent and bulbous.

Van Dyke's statement that the "striae and striae punctures appear to be absent" (*loc. cit.*) in *seymourensis* is not borne out by my examination of many specimens; the punctures are as large and distinct as are those in *galapagoensis*, but they are encrusted and obscured in many individuals.

The three entire specimens I have seen in addition to the type (kindly lent to me by Hugh B. Leech) are from the 1898 expedition of the Department of Zoology of Stanford University, California, which, during six months, visited all the larger islands of the Galapagos and many of the smaller ones.

#### ***Trox tenebrosus* Harold**

Figures 74, 76

*Trox tenebrosus* HAROLD, 1872, p. 130, "probably South America"; type, male, without locality label, in the Paris Museum, examined.

**DIAGNOSIS:** This flightless species differs from the fully winged but otherwise quite similar *ecuadorensis* by having black, not red,

antennal hairs, and much reduced wings. It differs from the preceding species in the bristly, dark setae of the elytral tubercles.

**RANGE:** Ecuador. Only one specimen (genitalia lacking), in addition to the type, has been examined; it is from Riobamba, about 100 miles south of Quito, at 2800 meters, collected June 30, 1905, by F. Ochs, and deposited in the United States National Museum.

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12 mm. Wings reduced in length and width. Male genitalia with median lobe specifically distinct, but almost like those of *ecuadorensis* (figs. 74, 76). Dorsum entirely coated.

Characters the same as those of *ecuadorensis* (which follows) except for the following: Antennal hairs black. Pronotum proportionately somewhat longer and larger, emargination in front of hind angles shallower, therefore hind lobes less prominent. Scutellum only slightly longer than wide. Elytra with humeral callus virtually obsolete, subapical callus absent, marginal interval wider, more explanate.

**REMARKS:** This species is as similar to its fully winged sibling, *ecuadorensis*, as is the short-winged *galapagoensis* to its fully winged sibling, *seymourensis*. The reduced wings have resulted in the usual modification, and thus *tenebrosus* differs from *ecuadorensis* by having obsolete calluses on the humeri and near the apex of the elytra; shorter scutellum and metasternum; more rounded outline to the elytra; and explanate elytral margins. The inner wings of *tenebrosus* are longer than the elytra and are bent under (folded), but they are only one-half of the width of the normal full wing of *ecuadorensis*. The male genitalia are almost the same as those of *ecuadorensis*, but in *tenebrosus* the large, flattened, blade-like part occupies only the apical third, whereas in the other species it occupies about one-half of the whole; the shape of the apex differs slightly (figs. 74, 75). Both species are apparently quite rare, and both occur in Ecuador.

The type of *tenebrosus* resembles the only other specimen examined (from Riobamba), except for its worn condition; it appears black (no coating), not gray, and the bristly hairs of the elytral tubercles are virtually lacking.

### *Trox ecuadorensis* Vaurie, new species

Figures 28, 75, 76

**TYPE MATERIAL:** Type, male, Quito, Ecuador, September 10, 1925, Vorbeck, collector, in Zoologiske Museum, Copenhagen. Four paratypes from Ecuador: one male, no

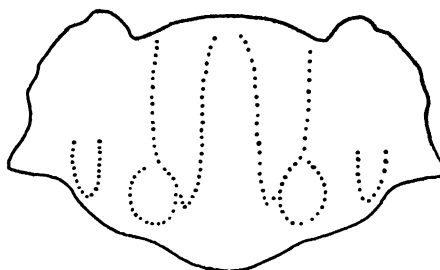


FIG. 28. Pronotal pattern of *Trox ecuadorensis*.

further locality, 2500 to 3000 meters (W. Schroder) in Zoologisches Museum, Berlin; one female, Quito, June 25, 1913 (C. G. Bangert), in Zoologiske Museum, Copenhagen; two females in Muséum National d'Histoire Naturelle, Paris, one from Quito, 1830 (R. Benoist), and one from Machachi, 9000 to 10,000 feet (E. Whymper).

**DIAGNOSIS:** Almost exactly like *tenebrosus*, but with red, not black, antennal hairs, and with full wings. This species differs from other species of the *brevicollis* group (except *tenebrosus*) by having shining, bronzy or black bristles emerging singly or in round clumps from the grayish coating of the elytra (best viewed in profile). *Trox pedestris* and *T. diffluens*, which also have some bristles, but usually yellow, on the elytra, differ by having shining, not coated, tibiae, and the elytral tubercles either very elongate (*diffluens*) or much larger and more elevated (*peditris*) than those of *ecuadorensis*.

**RANGE:** Ecuador. In addition to the type and four paratypes, three specimens have been examined: a female, Ecuador, with all the setae worn off (in Berlin Museum), and two females, Napo [= El Napo, Ecuador?], (in Paris Museum).

**DESCRIPTION OF TYPE, MALE:** (See description of group for characters omitted here). Length, 13.5 mm. Wings long. Male genitalia with median lobe specifically distinct, but nearly like those of *tenebrosus* (figs. 75, 76). Dorsum entirely coated.

Clypeus and antennae about like those of *brevicollis*, but hairs and scape of antennae red, and apex of deflexed part of clypeus not quite so sharp. Pronotum with elevated pattern (fig. 21), about like that of *brevicollis*, but ridges and tubercles coated, not black and bare, and punctures setose; base drawn backward in feeble lobe; sides as in figure 28, with distinct emargination in front of large, lobed hind angles, sides more or less emarginate to base; margins with short hairs. Scutellum like that of *brevicollis*, but apex rather rounded. Elytra on each side with four principal rows of feebly elevated, coated, round tubercles (12 or more to the subapical declivity), with tufts of short, coarse, dark, bristle-like, semi-erect setae emerging from them; alternate rows, as well as sutural and marginal intervals, with smaller setose tufts or with isolated setae; striae punctures large but rather obscured by coating; margins not crenulate but with tiny ciliae. Proepisternum and legs like those of *brevicollis*, except for front tibia which in *ecuadorensis* has two additional swellings behind the submedian tooth.

**VARIATIONS FROM TYPE:** The length varies from 11.5 to 13.5 mm. One or two individuals have fewer, more widely spaced, setose tufts in a row on the elytra and may have more distinct striae punctures. In one denuded specimen (Ecuador), which has virtually no coating or setae remaining, the exposed striae punctures are almost as wide as the sutural interval.

**REMARKS:** The stiff, dark, elytral bristles (black or bronzy), when in good condition and when seen at sufficiently high magnification, are diagnostic both of this species and of the flightless *tenebrosus*. In North America *capillaris* Say has the same kind of bristles.

This species is often confused in collections with *sallei* Harold (Bolivia, Ecuador, and Peru), which has quite similar pronotum and elytral pattern, but specimens of *sallei* have the sides of the pronotum more arcuate in front, the hind angles smaller, and the elytral tubercles elongate, not round, crowned with short tomentosity, not with actual bristles.

The apical portion of the median lobe of the male genitalia (figs. 73–75) is compressed like a knife blade in *ecuadorensis*, *tenebrosus*, and *sallei* and has no flanges when viewed

from above as are present in *haafi*, *hemisphaericus*, and *neuquen*. This blade is twice as wide in *ecuadorensis* and *tenebrosus* as it is in *sallei*, and in the former two species differs only slightly in outline.

***Trox brasiliensis* Vaurie, new species**

Figures 14, 67–69

**TYPE MATERIAL:** Type, male, Ypiranga, São Paulo, Brazil, December 1, 1937, Lange de Morretes, collector, in Departamento de Zoologia, Secretaria da Agricultura, São Paulo, and 31 paratypes from São Paulo state: 21 in same institution, three in the American Museum of Natural History, two in United States National Museum, two in Frey Museum, Munich, and three in collection of Antonio Martínez, Buenos Aires. (See Appendix for further locality data on paratypes and for localities of 27 additional specimens.)

**DIAGNOSIS:** Differs from other species of the *brevicollis* group (except *aeger*) by having a short basal carina of tubercles on the elytra (fig. 14). The species resembles *gemmingeri* and *pilularius* and differs from *aeger* in the distinctly excised sides of the pronotum. It differs from *gemmingeri* and *pilularius* and resembles *brevicollis* in the less elevated pronotal pattern which has the tubercles and ridges more or less merged and flattened.

**RANGE:** Brazil, mostly in the south, and Paraguay.

**DESCRIPTION OF TYPE, MALE:** (See description of group for characters omitted here). Length, 11 mm. Wings long. Male genitalia like those of *pilularius* (figs. 67–69). Dorsum uniformly coated.

Clypeus and antennae like those of *brevicollis*, except for yellow, not black, hairs on red scape. Pronotal pattern like that of *brevicollis* (fig. 21), but surface coated, sides excised sharply in front of hind angles which form sharp lobes, and sides of base emarginate. Scutellum like that of *brevicollis*. Elytra on each side with four principal rows of coated, strongly elevated, elongate, rather drop-like tubercles, some on first row longer than scutellum, tubercles apparently impunctate; suture and other rows with smaller tubercles, tenth interval at base with short carina of contiguous tubercles about as long

as humeral callus (fig. 14); striae with very large punctures (at least as wide as one-half of an interval); margins smooth, no hairs visible; marginal interval with flat, inconspicuous tubercles. Proepisternum and legs like those of *brevicollis*, but coating buffy, not gray, and middle and front tibiae with only one outer tooth; tooth of front tibia subapical.

**VARIATIONS FROM TYPE:** The size range is from 10 to 12 mm. In some specimens the elytral tubercles are visibly punctate. Worn or denuded specimens tend to have the striae punctures even more noticeable than in the type; heavily coated specimens have them hidden under the coat. Worn specimens are dark gray or blackish. The submarginal elytral carina may be longer than the humeral callus.

**REMARKS:** This appears to be one of the least variable species. It is curious that the male genitalia are almost identical with those of *pilularius*, even though the two species differ so notably in other characters, which is a reversal of the general rule in *Trox*, that species similar externally generally have distinct genitalia. In the present instance, *brasiliensis* differs from *pilularius* by having red, not black, antennal hairs, an additional short, submarginal carina on the elytra, a narrower scutellum, the marginal interval of the elytra without large tubercles, and the principal tubercles of the elytra more elongate, not so round, less elevated, and entirely coated, not bare at their bases.

The elytral tubercles of *brasiliensis* are about as elongate as are those in *longitarsis* and *chilensis*, species restricted to Chile, but in those species the tubercles have no coating. The tubercles of specimens of *aeger*, which has a submarginal carina on the elytra as in *brasiliensis*, are also bare of coating.

A specimen of this form, without locality, was marked "*gemmingeri*" by Harold and placed next to the type of *gemmingeri* in the Paris Museum. Although *gemmingeri* varies quite a bit in its elytral tubercles, they are nearly always larger and rounder than those of *brasiliensis*, the tubercles on the margin of the elytra are very much larger, the pronotum is more deeply sculptured, and the median lobe of the male genitalia is truncate, not acuminate.

### *Trox pedestris* Harold

Figures 30, 78, 79

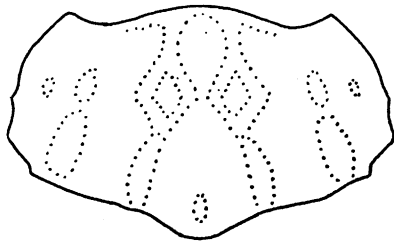
*Trox pedestris* HAROLD, 1872, p. 128, new name for *Trox denticulatus* Blanchard, 1846, p. 189, "dans les salines d'Andres-Paz en Patagonie, à quelques lieux au-dessus du village de Patagones" [Argentina], preoccupied by *Trox denticulatus* Olivier, 1789, an Old World species; type not found.

**DIAGNOSIS:** A combination of characters serves to identify this species: the curved, but not lobed, basal margin of the pronotum, the smooth face of the tibiae, the uncoated, shining surface of the elytra with very large striae punctures and round, tomentose tubercles, the strongly elevated sutural interval of the elytra, and the reddish marginal interval with tiny tubercles.

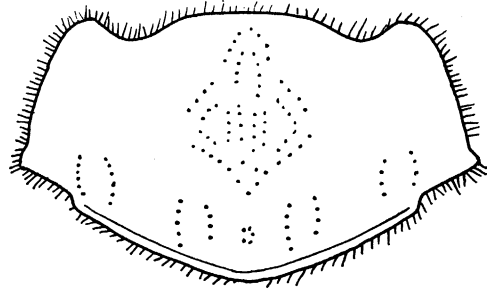
**RANGE:** Argentina. (For data on the 25 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12.5 to 13.5 mm. Wings long. Male genitalia specifically distinct (figs. 78, 79). Dorsum shining, except for tomentose tubercles of elytra.

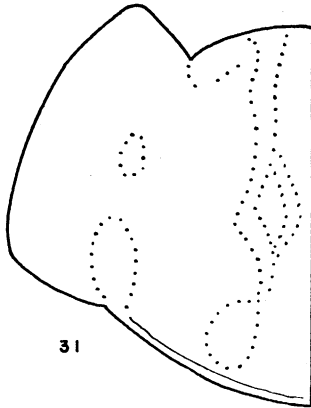
Clypeus with apical deflexed portion rather semicircular, not triangular, outline of front, seen from above, truncate. Antennae like those of *brevicollis*, but hairs and scape red. Pronotum punctate and with hairs emerging from punctures, center ridges and basal and lateral tubercles feebly elevated (fig. 30); base flatly curved; sides widening gently to hind angles which are right or acute, with a slight or strong emargination in front of hind angles; sides of base oblique; margins with hairs as long as those on disc; surface in some specimens coated and tomentose. Scutellum like that of *brevicollis*, but less elongate. Elytra on each side with four rows of convex, round (some elongate), tomentose and/or hairy, punctate tubercles about one-half of the size of scutellum, those at base of first row confluent in some specimens; suture strongly elevated, suture and other intervals with very small tubercles or with only a hair emerging from slight swelling; striae punctures large and deep; remainder of elytra shining, bare, reddish; margin smooth, with long ciliae; marginal interval mostly smooth, but with slight swellings or hairs present in some specimens. Proepisternum like that of



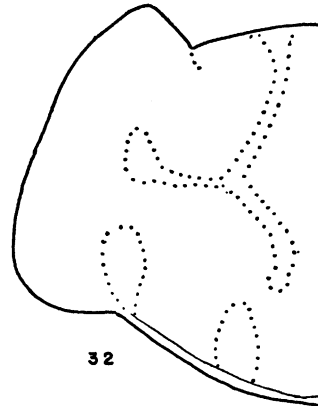
29



30



31



32

FIGS. 29-32. Pronotal patterns. 29. *Trox longitarsis*. 30. *T. pedestris*. 31. *T. bullatus*, typical. 32. *T. patagonicus*, typical.

*brevicollis*. Middle and hind tibiae not coated, furnished with long hairs on inner and outer lower edges, outer upper edge serrate, face of tibiae glabrous. Middle tibia with outer apical angle rather acute. Front tibia with median outer tooth and, in some specimens, with smaller basal teeth also. Hind tarsus about three-quarters of length of hind tibia.

REMARKS: Blanchard (1846, p. 189) found this species (his "*denticulatus*") "very different from all its congeners," but approaching, in the form of the thorax and in the tomentose tubercles of the elytra, *Trox luridus* Fabricius from Senegal. In South America it resembles somewhat both *gemmingeri* and *pilularius*, but differs from them by being larger, by having the pronotum more transverse and with the base not lobed, the scutellum shorter and wider, the suture of the elytra very strongly elevated, and the marginal interval with very small tubercles. The shape

of the pronotum is quite similar to that of specimens of *ecuadorensis* (figs. 28, 30), but that species differs from *pedestris* by having clumps of long coarse setae instead of tubercles on the elytra, and very differently shaped male genitalia. The genitalia of *pedestris*, when closed, resemble those of *chilensis*, but the median lobe is narrower and has a knob at the apex in *pedestris* (figs. 78, 79).

Three specimens in the Paris Museum may be part of Blanchard's original series of his "*denticulatus*"; they are labeled "Patagones, d'Orbigny, 1834." Blanchard described a number of species collected by d'Orbigny on the latter's voyage to the New World. There is also in Paris a "type" of *pedestris*, from Cordoba, Argentina, but this is only one of the specimens Harold used when he renamed *denticulatus*.

This is one of the species placed by Burmeister (1876, p. 264) in his group or subgenus *Polynoncus*, which consists of species



with no backward-pointing lobe on the base of the pronotum and with the median carinae of the pronotum angulate. Other species that would agree with a group so constituted are (except for *haafi* and *neuquen*) species with reduced or vestigial wings (the present *bullatus* group).

***Trox longitarsis* Harold**

Figures 29, 80, 81

*Trox longitarsis* HAROLD, 1872, p. 136, Chile, here restricted to the province of Concepcion; type in Paris Museum, examined.

**DIAGNOSIS:** This species is characterized by its extremely narrow, elongate, punctate, and bare elytral tubercles which alternate with single rows of large punctures that are as wide in diameter as some of the tubercles. The tubercles are narrower than those of *brasiliensis*, but of about the same size and shape as those of *sallei*; both these species, however, have the tubercles tomentose or covered with coating. The male has very long hind tarsi.

**RANGE:** Chile. (For data on the nine specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12 to 13.5 mm. Wings long. Male genitalia specifically distinct (figs. 80, 81). Dorsum coated, except for elevated parts of pronotum and elytra.

Clypeus like that of *brevicollis*, but emargination of front broader. Antennae like those of *brevicollis*, except for hairs of scape which are red. Pronotum less transverse than in most species (pattern as in fig. 29), ridges and tubercles punctate, somewhat flat, not outstanding; base drawn backward in obtuse lobe; sides scarcely widening to hind angles which are small, rounded lobes formed by excision of sides in front of angles; sides of base emarginate; margins apparently without hairs. Scutellum like that of *brevicollis*. Elytra with rows of bare, elongate, narrow, punctate tubercles, those on four principal rows of each elytron not uniformly very much larger than those of other rows (except for first principal row which does have larger tubercles); striae punctures evident even through coating that covers remainder of elytra; margins and marginal interval like those of *brevicollis*. Propisternum like that of *brevicollis*, except for absence of visible ciliae

on outer edge. Legs like those of *brevicollis*, except for tooth of front tibia which is subapical.

**REMARKS:** This species and *chilensis* (which follows) are apparently the only species restricted to Chile, although at least 14 other species occur in Chile. Both species have diagnostic elytra and male genitalia, and once seen are readily recognized again.

***Trox chilensis* Harold**

Figures 20, 82

*Trox chilensis* HAROLD, 1872, p. 137, "San Jago" [Santiago], and "Chili"; type is from Chile without further locality, in Paris Museum, examined.

**DIAGNOSIS:** Rather similar to *longitarsis* in the elongate, distinctly punctate, bare elytral tubercles, but differing from it and from other species by having, in addition to the distinct male genitalia, the humeral and subapical calluses of the elytra very prominent and bulging, the humeral callus overhanging the lateral margin of the elytra at base in such a way that the margin is more or less flattened and effaced (fig. 20). In most specimens the elytral tubercles are wider, higher, and longer than those in specimens of *longitarsis* or *brasiliensis*, and the pronotum is more transverse and not notably incised in front of the hind angles.

**RANGE:** Chile. (For data on the 13 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 13 to 14 mm. Wings long. Male genitalia with median lobe specifically distinct (fig. 82), genitalia when closed resembling those of *pedestris* (fig. 78). Elytra with dark coating in non-elevated areas.

Clypeus and antennae like those of *brevicollis*, except for hairs of antennal scape which are red. Pronotum, including pattern (fig. 21), like that of *brevicollis*, but basal lobe weaker, pronotum appearing more transverse. Scutellum like that of *brevicollis*. Elytra on each side with four rows of large (as large as, and usually longer than, scutellum), bare, strongly and abruptly elevated, mostly elongate, distinctly punctate tubercles, tubercles coated at base, shining on top; suture with smaller, elongate tubercles, and intervals with yet smaller, round tubercles; remainder of elytra

coated; margin smooth, hidden at base by humeral callus, margin with minute, scarcely visible ciliae; marginal interval with row of small tubercles that are larger toward apex of elytra. Proepisternum and legs like those of *brevicollis*, but front tibia with two or three tiny outer teeth.

REMARKS: This species resembles a larger, heavier *brasiliensis* with a more transverse, more deeply sculptured pronotum, with larger, more elevated, and distinctly punctate elytral tubercles which are shining, not coated, and with large, bulging, humeral calluses. The coating always appears black or grayish, not tan or buffy as is that of *brasiliensis*. The male genitalia, with the lateral lobes closed (in repose), resemble those of *pedestris*, but the tongue of the median lobe is broader than in males of *pedestris* and has no apical knob (fig. 82). Once recognized, there is no mistaking this species. The elytra are very similar to those of *alternans* MacLeay from Australia, but the latter species differs principally by having crests on the pronotum. One specimen has the metasternal depression very deep.

Of the five specimens of *chilensis* in the Oberthür collection in Paris, the first specimen is no doubt the type; it bears the name in Harold's handwriting, and it comes from the Stenheil collection, as stated by Harold (1872, p. 138).

***Trox diffuens* Vaurie, new species**

Figure 33

TYPE: Female, Leyda, Santiago, Chile, June, 1948, E. R. Leach collection, in the California Academy of Sciences.

DIAGNOSIS: In its greasy, velvety appear-

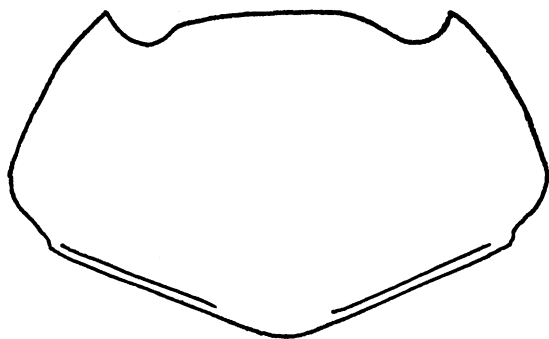


FIG. 33. Shape of pronotum, *Trox diffuens*.

ance, general shape, and smooth, not sculptured, pronotum, this species resembles the North American *tytus* Robinson, but differs distinctly from it by having the front of the clypeus deflexed, the scutellum with parallel, not constricted, sides, the tibiae serrate, and the pronotal sides angulate. The pronotal sides are nearly the same shape as are those of *loxus* (figs. 33, 39), but somewhat more rounded to the base, not so sharply angulate.

RANGE: Known only from the type locality.

DESCRIPTION OF TYPE, FEMALE: (See description of group for characters omitted here). Length, 13.5 mm. Wings long. Dorsum rather opaque, except for setose-tomentose tubercles of elytra.

Clypeus and antennae like those of *brevicollis*, but hairs of scape yellowish. Pronotum (fig. 33) smooth, without elevated pattern, but basal and lateral tubercles indicated faintly by feeble swellings; uniformly, finely punctate and with tiny hairs emanating from punctures; base drawn backward in obtuse lobe; sides widening to obtuse angle just beyond middle of pronotum, thence bent back obliquely to base; sides with tiny hairs as on disc. Scutellum like that of *brevicollis*. Elytra on each side with four principal intervals and suture furnished with elongate, narrow, scarcely elevated patches of dense setae (setae patch comprising only center third of interval), patches widely separated longitudinally from one another; other intervals with tiny tufts of setae, tufts scarcely visible on marginal interval; striae punctures large and deep; margins smooth and densely tomentose. Proepisternum like that of *brevicollis*. Middle and hind tibiae shining, smooth, virtually impunctate, strongly serrate with two or three teeth. Middle tibia with outer apical angle obtuse. Front tibia with two submedian small teeth. Hind tarsus about one-half of length of hind tibia.

REMARKS: This species differs from the first eight species of the *brevicollis* group by having the elytral tubercles tomentose-setose, not bare, and it differs from the remaining 12 species by having the sides of the pronotum entire, not excised in front of the hind angles. It differs further from the majority of species of the group by having glabrous tibiae; *pedestris* has glabrous tibiae but it has no

basal lobe on the pronotum, has long marginal hairs, and the elytral tubercles round. *Trox ecuadorensis* and *tenebrosus* have patches of setae on the elytra, but *diffluens* differs further from them by having the setae yellow, not black or bronzy, and less bristly, the patches of setae more elongate, the sides of the pronotum not emarginate, and the legs and under side not coated.

This species is similar in its pronotum and general appearance to *loxus* (Mexico, Brazil, Argentina) as well as to *tytus* (see diagnosis), both of which are in the *suberosus* group (sagittate scutellum and horizontal clypeus). It resembles somewhat *procerus* Harold from Africa but differs from it in the deflexed clypeus, the narrow elytral setae patches, and the glabrous tibiae.

#### SPECIES GROUP *bullatus*

**CHARACTERS:** Wings vestigial, perhaps absent. Head bituberculate (in denuded specimens, two elongate appendages are visible in front of tubercles). Clypeus at apex deflexed perpendicularly, the bent tip in form of a triangle, the apex blunt in *patagonicus*. Clypeal suture not visible owing to coating. Antennae with first segment (scape) black, hairs black (some hairs are dark red in specimens of *hemisphaericus*), funicle, inserted behind apex of scape. Eyes small (fig. 1), not prominent. Pronotum with base flatly curved or subtruncate, without lobe in front of scutellum (figs. 19, 31, 32), sides of base horizontal; sides of pronotum entire, not emarginate near base. Scutellum not longer than wide, shield-shaped or heart-shaped (figs. 8, 10), base ridged transversely. Elytra with stria punctures usually obscured by coating, humeral callus absent, therefore margin and marginal interval at base well visible from dorsal view, margin arcuate to base, marginal interval broad and explanate. Metasternal depression wider than long, shorter than second and third segments of abdomen combined. Median lobe of male genitalia with narrow "tongue."

The species of this group resemble those of the *brevicollis* group more than they do those of the *suberosus* group and could readily be placed with the *brevicollis* group. The species of the latter group, however, are either fully winged, or, as in *galapagoensis* and *tenebrosus*,

have shortened, but not vestigial wings.

The majority of characters that separate the species of this group from those of other groups in South America are associated with the atrophy of the inner wings. These characters include the small eyes, large pronotum, convex, roundish, shoulderless elytra, short, small scutellum, and short metasternum. Two species (*pastillarius*, *spatulatus*) of the *suberosus* group also have these characters, but they differ by having the clypeus horizontal and different male genitalia.

Burmeister (1876, pp. 264-265) placed a number of these species (*hemisphaericus*, *pampeanus*, and *patagonicus*) in a group he named *Polynoncus*, along with *argentinus*, *pedestris*, and *tenebrosus*. The characters he used to delineate the group were the arcuate, not lobed, hind border of the pronotum, the angulate median carinae of the pronotum, the strongly dentate front tibiae, and the denticulate middle and hind tibiae.

The faceted, or seeing, area of the eye is much reduced in these species of the *bullatus* group, and it is more or less the shape of a kidney bean, but the surface of the eye that is covered by black indument is about as convex and bulbous as in the species of other groups. In the latter the bulge of the eye is contiguous with the sides of the labial and mandibular region, but in the *bullatus* group there is a wide intervening area (figs. 1, 2).

#### *Trox bullatus* Curtis

Figures 1, 8, 31, 34, 35, 83, 84, 86

*Trox bullatus* CURTIS, 1845, p. 444, Valparaiso, Chile; type in the British Museum, examined.

**DIAGNOSIS:** Differs from *patagonicus* and *hemisphaericus* as stated in the diagnoses of those species. Both *bullatus* and *patagonicus*, once recognized, can readily be distinguished from other species in South America by their large size, prominent, shining elytral tubercles, and the absence of a humeral callus on the elytra (but see also *pampeanus*.)

**RANGE:** Chile, Uruguay, Argentina, and (one specimen each) Peru and Bolivia (fig. 34). (For data on the 96 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 14 to 18 mm. Wings absent or vestigial. Genitalia of male with median lobe specifically distinct



*laris* (Mexico and the western United States) resemble *bullatus* in shape and size and in the absence of prominent shoulder calluses, but *bullatus* differs principally by having the front of the clypeus deflexed, not horizontal, and a different type of male genitalia. I was unable to pry open the elytra of *bullatus* to examine the inner wings.

***Trox patagonicus* Blanchard**

Figures 32, 34, 36, 85, 86

*Trox Patagonicus* BLANCHARD, 1846, p. 186, "Patagonie . . . à l'entrée du Rio Negro sur les dunes [Argentina]"; type not found.

**DIAGNOSIS:** Differs from *bullatus*, which it resembles quite closely, by having the elytral tubercles usually only faintly, if at all, punctate, the pronotum with the anterior lateral tubercles connected to the angles of the central ridges, not separated from them by a longitudinal furrow, the median lobe of the male genitalia apically bisinuate, not emarginate, and by being generally somewhat larger. The clypeus (figs. 35, 36) differs also.

**RANGE:** Argentina and (one specimen only) Brazil (fig. 34). (For the 12 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 16 to 20 mm. (Blanchard, 1846, and Burmeister, 1876, give 22 mm.). Wings absent or vestigial. Genitalia of male with median lobe specifically distinct (figs. 85, 86). Dorsum coated, except for elevated parts of pronotum and elytra.

Clypeus with front outline, seen from above,

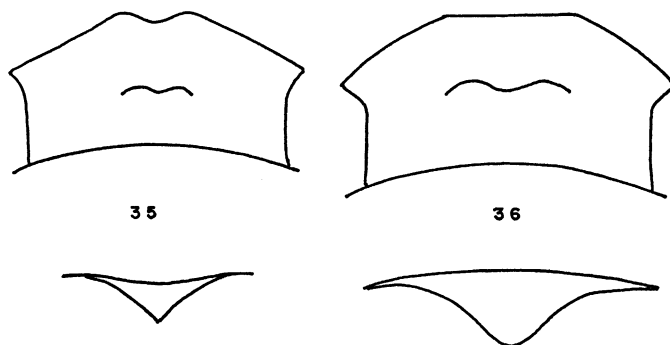
broadly truncate. Pronotum with pattern as in figure 32; side margins like those of *bullatus*. Elytra like those of *bullatus*, except for tubercles of principal rows which are often impunctate or only faintly punctate, and for those of marginal interval which are generally much smaller. Proepisternum and legs like those of *bullatus*.

**REMARKS:** Although the original description by Blanchard could apply equally well to *bullatus* as to *patagonicus*, the redescription by Burmeister (1876, p. 254) in his revision of Argentine species, is more specific. Unfortunately, Arrow (1912) and Blackwelder (1944) in their catalogues followed Felsche (1901) in synonymizing *patagonicus* with *bullatus*. I have not seen Blanchard's type, which cannot be found, but there are certainly, in my opinion, two forms in the material at hand. (See discussion of *bullatus*.)

The genitalia (figs. 83–86) were dissected on five males of *patagonicus* and were compared with those of 13 males of *bullatus*.

*Trox patagonicus* was the only South American species not seen by Harold at the time of his monograph (1872, p. 188), but he correctly placed it, from the description, near *bullatus*. It is apparently much less common than the latter (about one specimen of *patagonicus* to 12 *bullatus*) and, so far as known, does not occur in Chile, although *bullatus* does occur in Argentina.

**HABITS:** The type and other specimens collected by d'Orbigny were found under an old carcass of a cow on dunes by the sea (Blanchard, 1846, p. 187).



FIGS. 35, 36. Heads, showing contour of front of clypeus, dorsal view, and deflexed triangular part of clypeus, seen from front. 35. *Trox bullatus*. 36. *T. patagonicus*.

***Trox pampeanus* Burmeister**

Figures 17, 19, 87, 88

*Trox pampeanus* BURMEISTER, 1876, p. 255, "Pampas-Gebiet . . . Tucuman, Catamarca . . . Rio Cuarto . . . El Carmen . . . [Argentina]"; type not designated, but four cotypes in Museo Argentino de Ciencias Naturales, Buenos Aires, one, from Tucuman, examined.

**DIAGNOSIS:** This species, although usually smaller than *bullatus* and *patagonicus*, resembles them generally in the pronotal and elytral pattern, but differs by having the outer apex of the middle tibia toothed and acute (fig. 17), the elytra toothed or acute on the shoulders (fig. 19), and differently shaped male genitalia. The clypeus, seen from above, is truncate as is that of *patagonicus*, not emarginate as is that of *bullatus*, nor rounded as is that of *hemisphaericus*.

**RANGE:** Argentina. (For data on the six specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 11.5 to 14 mm. (16 to 17 mm., according to Burmeister, 1876). Wings vestigial or lacking. Genitalia of male specifically distinct (figs. 87, 88). Pronotum coated, except for two bare, elevated, narrow, angulate median lines and summits of one or both of the lateral tubercles; sides and apex of elytra coated.

Clypeal outline in front truncate. Pronotum with pattern as stated above; sides of pronotum briefly ciliate, subparallel, hind angles rounded off at right angles, base at sides horizontal. Elytra like those of *bullatus*, except for presence of sharp angle extending forward on shoulder and for crenulate side margins. Proepisternum and legs like those of *bullatus*, except for middle tibia which has sharp tooth on outer apical angle.

**REMARKS:** Burmeister's description is not at all diagnostic. Fortunately, through the courtesy of Dr. Manuel J. Viana of the museum in Buenos Aires, I have examined a cotype from Tucuman and one other specimen (from Bahia Blanca), both of which agree, except for their larger size, with a specimen from "Cord. Davis" in the American Museum of Natural History. In a specimen from Estancia Barrau, Buenos Aires, the humeri are not obviously toothed as they are in other specimens, but the characters of the pronotum, middle tibiae, and the crenulate mar-

gins of the elytra show that it is this species, not *bullatus* or *patagonicus*. In addition, it is a male, and the genitalia of this species are diagnostic; they are somewhat like those of *bullatus* and *patagonicus*, but the median lobe is much more widely expanded at the apex, and the apex has a curling edge or border on its under side that fits into the piece on which it rests (figs. 87, 88).

***Trox hemisphaericus* Burmeister**

Figures 4, 59, 89

*Trox hemisphaericus* BURMEISTER, 1876, p. 253, Rio Santa Cruz, southern Patagonia [Argentina]; nine cotypes in Museo Argentino de Ciencias Naturales, Buenos Aires.

*Trox globulatus* FAIRMAIRE, 1883, p. 490, Punta-Arena[s], Chile; type not found in Paris Museum.

**DIAGNOSIS:** This species has more rounded, more convex elytra than *bullatus*, from which it differs further by having very long hairs on the inside of the middle and hind tibiae and on the disc of the proepisternum, flat elytral tubercles, and distinct marginal hairs on the elytra. The shape and pattern of the elytra are more like those of *pastillarius*, but the elytral tubercles are only one-half of the size of those of *pastillarius* and the clypeus is deflexed, not horizontal as that of *pastillarius*.

**RANGE:** Southern Argentina and southern Chile. (For data on the 21 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 12 to 15.5 mm. (type said to be 17 mm.). Wings vestigial or absent. Genitalia of male with median lobe specifically distinct (fig. 89), but genitalia dorsally resembling those of *neuquen* and *haafi* (fig. 59). Dorsum coated except for tubercles of elytra.

Clypeus with front outline, seen from above, gently curved. Pronotum with pattern about as in *brevicollis* (fig. 21), but obscured in most specimens by thick coating; sides broadly widened toward base, slightly sinuate before hind angles, and apparently crenulate and with long setae, surface of pronotum with shorter setae; base at sides horizontal. Elytra on each side with four rows of large (about the size of scutellum), bare, flat, roundish, apparently impunctate tubercles (from six to 10 or more on a row from

base to declivity of elytra), suture with smaller, more elongate tubercles, each interval with three rows (not always visible) of tiny tubercles; remainder of elytra, unless denuded, filled with grayish yellow coating; margins uneven, in some specimens appearing crenulate, ciliate (hairs as long as, or longer than, those on margins of pronotum); marginal interval with two or three rows of tiny, bare tubercles. Proepisternum like that of *bullatus*, except for disc which is covered with stiff hairs. Front tibia like that of *bullatus*. Tibiae and tarsi coated, middle and hind tibiae setose, outer edges serrate, inner edges with dense fringe of hairs as long as width of tibiae. Middle tibia with outer apical angle toothed.

REMARKS: This is apparently the southernmost species of South America, not occurring farther north than the provinces of Neuquen and Rio Negro in Argentina. I have seen two specimens from Ultima Esperanza, Chile, a sinuous bay near Tierra del Fuego, at about latitude 52° S., and the type of *globulatus* Fairmaire was collected from even farther south, from Punta Arenas in the Strait of Magellan. I have not seen the type of *globulatus*, but Berg (1884) examined it and said it was the same as *hemisphaericus*.

The elytra in some specimens are about as wide as long and nearly circular (fig. 4). The marginal interval is very broad, especially near the middle of the sides, and it accommodates three rows of small tubercles. The hairs on the elytral margins are worn off in a number of specimens, but the hairs of the tibiae and proepisternum are visible in all specimens examined. The coating on the pronotum is usually extremely thick and obscures the pattern. The wings are probably quite minute, but I could not open the fused elytra.

The size and the arrangement of the tubercles on the elytra are similar to those of *neuquen* and *haafi* of the *brevicollis* group, but those species differ by having full wings, elongate scutellum and elytra, and the apex of the median lobe of the male genitalia slightly different (fig. 89). Seen dorsally, however, the male genitalia of these three species are similar (fig. 59), and the median lobes are of the same type (figs. 57, 58), with an elongate "tongue" that has its apex concave on both sides. Perhaps they are more closely re-

lated than their position in different groups indicates. All occur in the province of Neuquen, and two specimens of *hemisphaericus* were taken at the same time as the type of *haafi* at the Gulf of St. George in Comodoro Rivadavia.

#### SPECIES GROUP *suberosus*

CHARACTERS: Wings long (except in *pastillarius* and *spatulatus*). Head bituberculate, more or less transversely so, but amount of coating on head distorting size and shape of tubercles. Clypeus horizontal, not deflexed at tip (except for *ciliatus*); clypeal suture rarely visible owing to heavy coating, but forming an obtusely angulate triangle in front of head tubercles; clypeus with a furrow present behind front border but usually filled in by coating or mud. Eyes large and bulbous (except in *pastillarius* and *spatulatus*). Antennae with funicle inserted under overhanging scape, away from, not at, apex of scape. Scutellum sagittate or arrowhead shaped (figs. 5, 6), but not obviously so in *pastillarius* and *spatulatus* (fig. 7), not much longer than wide, sides angulate at middle. Elytra with stria punctures usually obscured by coating. Male genitalia with median lobe simple (figs. 90-101).

This group differs from the other groups by having the scutellum sagittate, or angularly lobed at the middle of the sides, the clypeus (except for *ciliatus*) with its apex (whether triangular as in six of the species, or subtruncate as in *candezei*), on the same level as the disc of the clypeus, not bent sharply downward at an angle, and the genitalia of the male more simple in form, with the median lobe large and appearing uniform.

This group, like the *scaber* group, comprises additional species (15) in North America, and *suberosus* and *loxus* occur on both continents. Some of the characters given by Vaurie (1955, p. 22) for the species of the group in North America need to be changed for the inclusion of the South American species. Thus the hind tibiae may have slight serrations (as in *borrei*, *spatulatus*, and *pastillarius*), the elytra may have marginal setae (as in *borrei*, *ciliatus*, and *candezei*), the pronotum may be differently patterned (as in *pastillarius* and *spatulatus*), it may have no ridges (as in *ciliatus* and *candezei*), and the clypeus may be rounded-



truncate in front and have the edge somewhat deflexed (as in *ciliatus*).

***Trox suberosus* Fabricius**

Figures 3, 5, 15, 43, 90

*Trox suberosus* FABRICIUS, 1775, p. 31, Brazil; type said to be in the Banks collection, British Museum.

*Trox crenatus* OLIVIER, 1789, p. 7, Cayenne [French Guiana]; type not found.

Only the synonymy relating to South American species is given here; for additional synonymy, see Vaurie (1955), Haaf (1954a, 1958a, 1958c), or any catalogue.

**DIAGNOSIS:** The coated, feebly costate elytra with or without bare, black areas along the costae, and the excised pronotum are almost identical with those of *persuberosus*, but *suberosus* is generally smaller, has different male genitalia, and has the inside of the middle tibia entirely coated, not bare and black at the base. The species differs from others of the group in South America, except *persuberosus*, by having the sides of the pronotum excised in front of the hind angles (fig. 43).

**RANGE:** All South America, including the Galapagos Islands, north into Central America, Mexico, and all the United States except the extreme northeastern parts; also probably all the Greater and Lesser Antilles, the Bahamas, and Bermuda. One elytron was found on the Cape Verde Islands off Africa (Harold, 1872, p. 123). Haaf (1958c) reports the species from Australia. (For data on the 299 South American specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 9 to 14 mm. Wings long. Male genitalia (fig. 90) specifically distinct. Dorsum coated except for some black, bare spots on elytral costae.

Clypeus in front obtusely angled, apex sharp. Antennae with scape, including its hairs, and club reddish yellow. Pronotum with dorsum, at least in front, quite smooth, without marked ridges; four basal tubercles visible but not outstanding; base lobed in front of scutellum; lateral margins ciliate (hairs about half as long as hairs on antennal scape), gradually widening to basal fourth where deeply excised or emarginate in front of hind angles, the latter forming distinct

lobes, basal margin at sides also emarginate. Elytra, humeral callus prominent, suture and four principal (odd) rows of each elytron only slightly elevated above other rows, elytra in many specimens appearing obsoletely costate (and truly costate in some specimens); elytra (as seen in fresh specimens) composed of four rows of elongate, tomentose, slightly elevated tubercles alternating along the row with black, bare, and flat areas (the black areas often covered with coating); margins of elytra not crenulate, but with scarcely visible fringe of dense hairs and some longer setae; marginal interval not tuberculate. Proepisternum ciliate on outer edge, disc not setose, inner front edge sparsely hairy. Metasternal depression at least as long as combined length of second and third abdominal segments. Tibiae and tarsi coated, tibiae sparsely ciliate on inner edge, sparsely setose but not serrate on outer edge. Front tibia with single submedian or antemedian tooth on outer edge. Middle tibia with outer apical angle rounded or obtuse.

**REMARKS:** This is the farthest ranging and certainly one of the most abundant of the American species. It is readily distinguished from other species except *persuberosus* by the combination of the sagittate scutellum, horizontal clypeus, rather smooth elytra and pronotum, and the strong emargination of the pronotal sides in front of the hind angles. Furthermore, the male genitalia, at least in South American specimens, are diagnostic of the species.

This is one of the few New World species that occur on islands. The only other species known from islands in the Western Hemisphere are the tiny *insularis* Chevrolat, evidently endemic to Cuba, the larger *tytus* Robinson, taken from barn-owl nests in Cuba as well as on the North American continent, and the two species endemic to the Galapagos, *galapagoensis* and *seymourensis*. Mutchler (1925) was the first to publish the presence of *suberosus* in the Galapagos Islands (Indefatigable [Santa Cruz], and Tower [Genovesa]) which he did when he described *seymourensis* from South Seymour [Baltra] Island. Van Dyke (1953, p. 124) lists a number of other islands in the Galapagos for *suberosus*, and I have seen specimens from those he mentions as well as from Santa Cruz; thus

this species is known now from eight of the 14 larger islands (there are 20 islands with names). In the Lesser Antilles, *suberosus* has been reported from Guadeloupe and St. Vincent, and I have seen it from the Virgin Islands, St. Bartholomew, and Barbados. In the Greater Antilles, I have seen it from Puerto Rico, including the tiny Vieques Island, and from Haiti, Cuba, and Jamaica; in the Bahamas from Andros and New Providence islands; in the Bermudas from St. George Island. From the other side of the continent I have seen specimens from Georges Island in the Gulf of California. The distribution in Central America was not broken down into countries by Vaurie (1955), but I have now examined specimens from British Honduras, El Salvador, and Nicaragua; Blackwelder (1944) reports the species also from Guatemala. For Mexico, Sinaloa should be added to the states in which it occurs (Vaurie 1955, p. 6, table 1); thus it has been found in at least 18 of the 25 states of Mexico. It is apparent that *suberosus*, as well as other *Trox* of the Western Hemisphere, is seldom found in the region between the equator and latitude 14° or 15° N.

This species, although individually variable, seems not to show geographical variation. Some specimens from Argentina (La Rioja, La Plata, and "Cord.[oba?] Davis") have considerably more as well as larger black spots on the elytral costae than are found in the majority of specimens, but these spots show, apparently, only when the covering or coating becomes worn, and this pattern is duplicated throughout the range of the species. Three or four specimens from Santa Cruz, Bolivia, some from Paraguay, and one from Batataes, Brazil, have the tubercles of at least the two inner principal rows of each elytron much more elevated than usual and with a heavier tomentosity; the males have slightly different genitalia. Possibly these represent another species, but I believe that they are variants of *suberosus*.

A specimen without locality labeled "*suberosus*" and with another label beside it saying "type" is in the Banks collection at the British Museum. This specimen, however, is a specimen of *monachus* Herbst, 1790, a species that does not occur "in Brasilia" as stated by Fabricius (1775, p. 31), but in the eastern

United States. *Trox monachus* Herbst is one of the best-characterized and most readily identifiable species of *Trox* (Vaurie, 1955, p. 65), and it seems most improbable that this specimen is in fact the type of *suberosus* Fabricius. This specimen, moreover, does not agree with Fabricius' description, namely, that *suberosus* has "*elytris striatis*," as the elytra of this specimen are distinctly dotted with large, round, encrusted tubercles. Fabricius says also that the elytra are "*minus rugosa, quam in precedente*" [*sabulosus* Linnaeus], which is certainly not true of the tubercular Banks specimen. Herbst, when he described *monachus* 15 years after Fabricius' description, mentioned its elytra as "*tuberculorum plenis*" and in the same paper he discussed *suberosus* with its elytra "*striatis*" and not "*rugosa*." Harold, in his monograph of *Trox*, and all previous and subsequent authors leave no doubt that the *suberosus* of Fabricius is understood to represent the smooth, non-tuberculate species that is so abundant throughout the Western Hemisphere, and not the tuberculate specimen in the Banks collection. It seems plausible, therefore, that Fabricius based his description on another specimen that was apparently in the Banks collection. In other words, the authenticity of this alleged "type" is open to question. The nomenclature of nearly two centuries cannot be upset without incontrovertible proof.

**HABITS:** Found in many situations, under various kinds of carrion, under cow chips, at malt, on chicken feathers, at light. Two specimens in the United States National Museum are labeled "in bones from Argentina to New York"; others as being found in bones sent from Argentina to Seattle. Undoubtedly this means is one of the many ways by which this species has become so widespread. It is also reported by Candèze (1870–1871) as one of the species found in shipments of wool from Buenos Aires to the factories in Belgium (the other species are *aeger*, *pilularius*, and *scaber*). Ritcher (1958, p. 325) says that the larvae "are known to prey on grasshopper eggs and are of considerable economic importance."

***Trox persuberosus* Vaurie, new species**

Figures 37, 38, 43, 91, 92

**TYPE MATERIAL:** Type, male, Ypiranga, São Paulo, Brazil, October, 1913, H. von

Ihering and H. Luederwald, collectors, in collection of Departamento de Zoologia, Secretaria da Agricultura, São Paulo, and 40 paratypes from state of São Paulo: 15 in same institution, 12 in Cornell University, seven in United States National Museum, five in the American Museum of Natural History, and one in Frey Museum, Munich. (See Appendix for further locality data on paratypes and for localities of 55 other specimens.)

**DIAGNOSIS:** Although almost identical to *suberosus* in shape, color, and pattern, this species differs by being larger (14 to 17 mm. as against 9 to 14 for *suberosus*); by having the inner basal half of the middle tibia always bare, shining, and black (fig. 38) instead of covered with coating, the middle tibiae more curved; and by having in the male subapical hairs on the hind tibia and very different genitalia (figs. 90, 91).

**RANGE:** Eastern Brazil, Paraguay, Uruguay, northern Argentina, Bolivia, and Peru, the great majority of specimens being from Brazil (fig. 37).



FIG. 37. Distribution of *Trox persuberosus*.

**DESCRIPTION OF TYPE, MALE:** (See description of group for characters omitted here). Length, 16 mm. Wings long. Male genitalia specifically distinct (figs. 91, 92). Dorsum coated with yellowish glaze, except for a few bare black areas between some of the elytral tubercles.

Clypeus, antennae, and pronotum like those described for *suberosus*. Elytra like those of specimens of *suberosus* with only a few black areas showing and with the tomentose tubercles elevated and distinct, not elongate or tending to be costate. Ventral side and legs like those of *suberosus*, except for middle tibia which has a denuded, black area on the inner side in basal half, and is more curved, and for the hind tibia which in the male only has a thick fringe of golden hairs on the inner side near apex.

**VARIATIONS FROM TYPE:** The length of all specimens seen ranges from 14 to 17 mm. A number of specimens are greased; consequently their coat is gray or dull piceous instead of yellow or tan. In some specimens the bare black spots of the elytra are more noticeable or more numerous; in some the tubercles are more elongate; and in some they are shorter and closer together. Female specimens have about 12 or 15 hairs spread along the inner edge of the hind tibia, whereas males have at least 24 contiguous hairs in the apical half.

**REMARKS:** This handsome species has masqueraded as merely a large *suberosus* for almost a hundred years, and dorsally it certainly resembles that species. Harold (1872, pp. 120-121) apparently had a specimen of it and called it "Var. a" of *suberosus*, stating that it was very large, 17 mm., of light yellow color, without shining black places on the elytra, and with indistinct elevations on the pronotum. He gave the Antilles as well as Brazil for its range, however, and, as far as I know, only *suberosus* occurs in the Antilles.

This is one of the few species of American *Trox* in which males can be distinguished from females without the dissection of the genitalia. In *longitarsis* (Chile), males have longer hind tarsi than females, and males of two species from the United States (*hamatus* and *texanus*) have, respectively, enlarged hind tibiae and the hind tibiae emarginate on the inner side near the apex.

***Trox loxus* Vaurie**

Figures 39, 93

*Trox loxus* VAURIE, 1955, p. 58, figs. 4C, 17, El Palmar, 16 kilometers west of Tetzonapa, Veracruz, Mexico; type, female, in the Museum of Comparative Zoölogy, examined.

DIAGNOSIS: Differs from all other species of this group by having the side margins of the pronotum oblique and angulate, not (fig. 39) parallel or incised. It resembles a species in the *brevicollis* group (*diffluens*, Chile) in these margins and also in the over-all velvety coating, but differs from it in the sculpture of the pronotum, the sculpture of the elytra, and the shape of the scutellum.

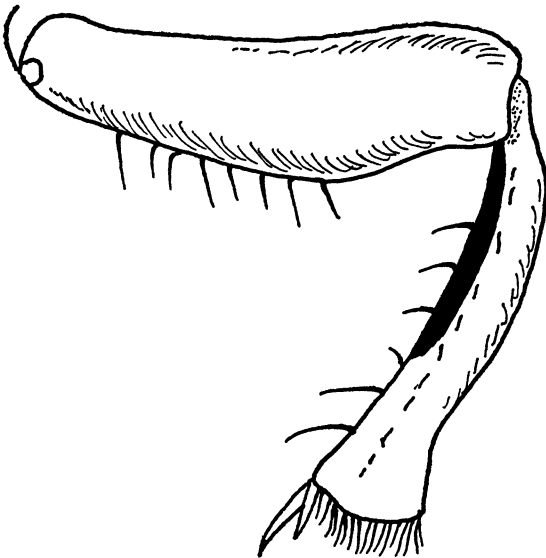


FIG. 38. Left middle tibia of *Trox persuberosus*, showing characteristic black bare strip on inner side.

RANGE: Southeastern Mexico, Brazil, and northwestern Argentina. (For data on the 11 specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 8.5 to 10.5 mm. Wings long. Male genitalia as shown in figure 93. Dorsum entirely coated and with tiny hairs emerging.

Clypeus and antennae like those of *suberosus*. Pronotum with two nearly parallel, narrowly separated median ridges (or lines) and four basal tubercles (more marked in the specimens from South America than in the

type, in which they are worn rather smooth); base drawn back in obtuse lobe in front of scutellum; lateral margins ciliate, with short hairs; sides broadly widened to a little beyond middle, thence bent back obliquely at an angle to base. Elytra like those of *suberosus* except that there are no bare patches in *loxus* and the surface is rougher, more uneven, with the tubercles larger, more elevated, more widely separated, and with short hairs emerging from each tomentose tubercle; marginal interval in some specimens with a series of tiny tubercles. Proepisternum, metasternal depression, and legs like those of *suberosus*, except for front tibia which has outer tooth obsolete or scarcely visible.

REMARKS: With the exception of the widespread *suberosus*, this is the only species known to occur in both Mexico and South America. At the time of its description (Vaurie, 1955), only the type (Veracruz, Mexico) and a doubtful specimen from Argentina were available. Now that I have seen nine additional specimens from Brazil and Argentina, it is apparent that this is truly a South American species and that the specimen from Mexico was probably carried to the port of Veracruz by chance. The additional material seen includes males, which makes it possible to figure the genitalia (fig. 93).

The type of *loxus* is evidently rather worn and thus appears flatter and smoother on those parts that are more elevated in the other specimens. The tubercles on the inner rows of the elytra in one of the specimens from Santa Catarina, Brazil, and in the specimen from the state of São Paulo are very large and elongate; the São Paulo specimen has only three tubercles on the inner row on one side of the elytra. On two specimens, the coating is grayish black; on the type and one other specimen it is tan or buffy.

*Trox loxus* is similar in general shape to the somewhat smaller *borrei* which also has a robust, compact form, with convex, swollen elytra, but which differs in the shape of the pronotum and in the sculpture of the elytra.

***Trox borrei* Harold**

Figures 40, 94

*Trox Borrei* HAROLD, 1872, p. 84, Montevideo [Uruguay]; type in Paris Museum, examined.

*Trox Badeni* HAROLD, 1872, p. 83, Ceara, north-

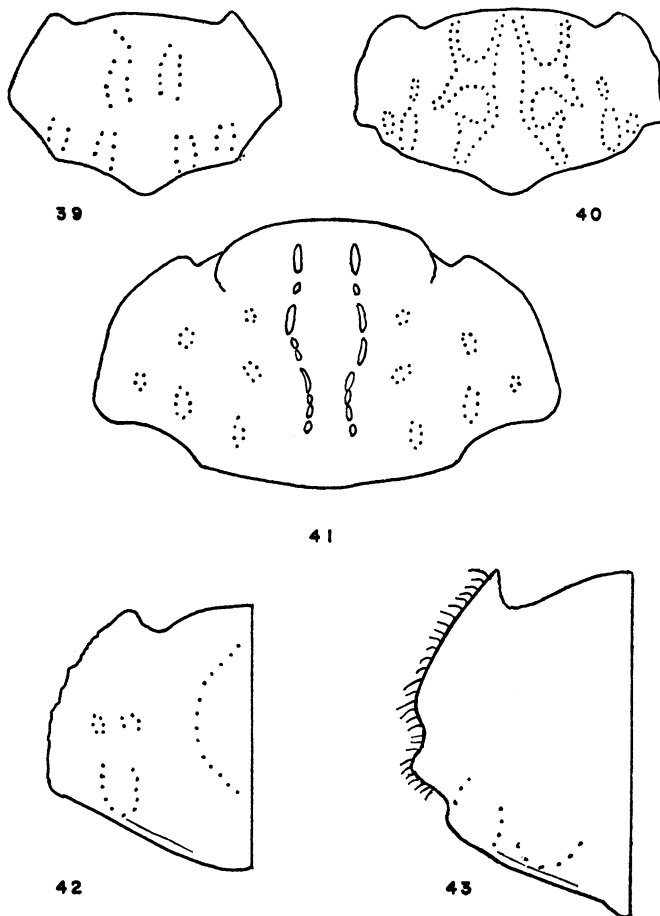
ern coast of Brazil; type in Paris Museum, examined. New synonymy.

**DIAGNOSIS:** The characteristic elytral pattern of large, bare, black plaques on the five even (not, as normally, the odd) intervals and the narrow, elevated, coated lines on the suture and odd intervals is about the same as the pattern of *pastillarius*, but *borrei* differs by having a different pronotal pattern (figs. 40, 41), strong humeral callus (*pastillarius* has vestigial wings), red, not black, antennal and buccal hairs, and the pronotum lobed in front of the scutellum.

**RANGE:** Brazil, Bolivia, Uruguay, Paraguay, and Argentina. (For data on the 21 specimens examined, see Appendix.)

**DESCRIPTION:** (See description of group for characters omitted here). Length, 7.5 to 8.5 mm. Wings long. Male genitalia as shown in figure 94. Dorsum coated except for round, bulbous, shiny, black tubercles of elytra.

Clypeus and antennae like those of *suberosus*. Pronotum with rather complicated pattern of ridges (carinae) and tubercles (fig. 40); base drawn backward in obtuse lobe; lateral margins minutely ciliate, slightly crenulate, or at least uneven in outline, scarcely widening to hind angles which are rounded off, thence margin emarginate and constricted to base. Elytra with humeral callus prominent, suture and odd rows of each elytron (3, 5, 7, 9) composed of elevated,



FIGS. 39-43. Pronotal patterns. 39. *Trox loxus*. 40. *T. borrei*. 41. *T. pastillarius*; characteristic also of *T. spatulatus*. 42. *T. peruanus*, showing slightly crenulate lateral margin. 43. *T. persuberosus*; characteristic also of *T. suberosus*.

narrow, tomentose ridges, uniformly costate on the inner rows, but broken into separate, elongate, tubercular patches on outer rows; even rows (2, 4, 6, 8) with five or six or fewer large, round, bare, convex, impunctate tubercles nearly as large as scutellum, these tubercles alternating longitudinally with elongate, tubercular, tomentose patches similar to those on outer ridges; margins of elytra ciliate; marginal interval with a series of minute tubercles. Proepisternum, metasternal depression, and legs like those of *suberosus* except for four or five slight serrations on outer edge of middle and hind tibiae.

REMARKS: This species is scarcely larger than the tiny *scaber* and is slightly smaller than *loxus* and *bifurcatus*. Characteristic specimens have the large (in some examples as large as the scutellum), black, elytral "buttons" round and entirely bare, and only four or five on each row of the elytra from the base to the subapical declivity, but some individuals have these tubercles smaller and have six or seven in a row. In a few individuals (as in the type of "*badeni*") the round "buttons" are not only flattened, but are also partially or entirely glazed over, and these specimens differ further from the typical specimens (such as the type of *borrei*) by having the narrow ridges of the odd intervals more uniformly costate, not interrupted. I believe, however, that these are the same species and that *badeni* is a synonym of *borrei*. Although *badeni* has page priority, the description of *borrei* agrees better with the majority of specimens seen.

The large specimen (15 mm.) from "Gamlico" (?) opposite the label for *badeni* in the Oberthür collection in Paris is not *badeni*; the type of *badeni* is labeled "Brazil," has "*mihi*" in Harold's writing, and is only 8 mm. long, which is the length given by Harold; it is in a different place in the Paris collection.

Although Burmeister (1876, p. 263) stated that he had not found *borrei* in Buenos Aires, it does occur in some places, at least, in Argentina.

#### *Trox pastillarius* Blanchard

Figures 1, 7, 41, 44-46, 49, 95, 97

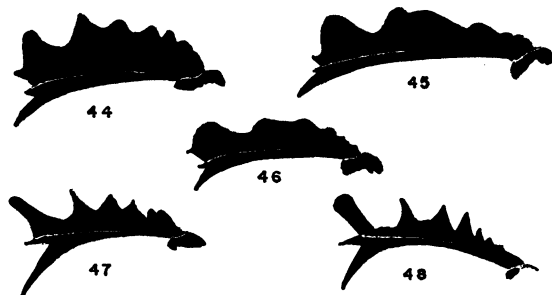
*Trox pastillarius* BLANCHARD, 1846, p. 187, Patagonia, "la baie de San-Blas" [Argentina]; type not found.

DIAGNOSIS: Dorsally almost exactly similar to *spatulatus*, but differing in the legs and in the shape of the male genitalia (see *spatulatus* and table 2). The species differs from others of the group, except for *spatulatus*, by having a characteristic pronotal pattern (fig. 41), part of which may be obscured by coating, by having small eyes, a truncate base to the pronotum, and vestigial inner wings.

RANGE: Bolivia, Argentina, and Chile (fig. 49). I have seen an old specimen in the British Museum labeled "Antilles S. Domingo," but I question this locality. (For data on the 61 specimens examined, see Appendix.)

DESCRIPTION: (See also description of group for characters omitted here). Length, 9 to 15 mm. Wings apparently lacking. Male genitalia as shown in figures 95 and 97. Dorsum coated except for elevated parts.

Clypeus like that of *suberosus*. Antennae with scape, including hairs, black; club gray-black. Pronotum, even if completely caked with whitish coating, showing a black truncate edge across apex, the black turning at right angles to extend a short way onto front of pronotum, making a kind of hood (fig. 41); remainder of pronotum (unless entirely coated) with two bare, median, beaded lines or crests from apex to near base with a furrow between, each side of pronotum in basal half with six small, round, evenly spaced tubercles (the outer ones often covered); base virtually truncate; side margins somewhat wrinkled and uneven, slightly widening to rounded off, right-angled hind angles, gently curved inward to base. Elytra very convex, humeral callus absent, margins at base with an inner shoulder angle or tooth; suture (as first row), and third, fifth, seventh, and ninth rows of each elytron with beaded lines of tiny



FIGS. 44-48. Serrations of right front tibiae. 44-46. *Trox pastillarius*. 47, 48. *T. spatulatus*.

tubercles, third, fifth, and seventh having a very large basal tubercle (outer rows of tubercles often hidden by coating), even rows with large bare "pastilles" or plaques at least twice as large as scutellum, only one or two plaques on some rows, but six or seven on inner row, plaques connected by beaded tubercles, basal tubercles of inner rows fused into a long mass in some specimens; margin of elytra and marginal interval with double or triple rows of tiny tubercles, this area appearing simply rugose in coated specimens. Proepisternum sparsely ciliate on disc and with dense, coarse, black or bronze, bristly hairs spreading onto disc from inner edge. Metasternal depression not longer than length of one abdominal segment. Tibiae and tarsi coated, tibiae scarcely ciliate on inner edge. Middle and hind tibiae with small serrations on outer edge. Front tibia with four or five large, lobed serrations and one or two smaller, sharper, basal teeth (figs. 44-46). Middle tibia with outer apical angle acutely toothed. Tarsi of middle and hind legs with tufts of bristles on inner edges of each segment, bristles twice as long as bristles of outer edges.

REMARKS: Burmeister (1876), considering this ovate, convex, virtually wingless species unique among Argentine species, placed it as a separate group (*Chesas*) which he characterized as having the base of the pronotum arcuate-truncate, the pronotal carinae subparallel, the front tibiae strongly dentate, the four posterior tibiae denticulate on the outer edge, and the hind tibiae "nude" and scarcely ciliate. I am placing it with the species of the *suberosus* group because it has the clypeus horizontal and a simple type of male genitalia, two characters by which it differs from the flightless species of the *bullatus* group. Nevertheless it resembles the latter species superficially owing to the absence of long wings and the resulting modifications. On a specimen of *pastillarius* measuring 13 mm. in total length the inner wing was a mere tiny ribbon about 4 mm. long and 1 mm. wide.

The nude tibiae mentioned by Burmeister are not characteristic of the majority of specimens, which have a buffy coating on the legs as well as on the dorsal surface. Some specimens, of course, have this coating partially worn off. There is, however, another, gener-

ally smaller, very similar species (*spatulatus*) which, in all specimens that I have seen, has nude tibiae and has long been confused with *pastillarius* (see table 2 for comparisons). I do not believe Burmeister had *spatulatus* among his specimens, because he said that they were all larger than 12 mm. (*spatulatus* is smaller), that the largest tooth of the front tibiae was very broad (it is narrow in *spatulatus*), and that there were no hairs on the tarsi (there are very long ones in *spatulatus*).

A more important question is whether Blanchard had *spatulatus* when he described *pastillarius*. His description, except for the larger size (12 to 16 mm.), agrees with that of each species. Unfortunately, his type or types of *pastillarius* have not been found, but two specimens that I examined in the museum in Paris, collected in 1834 by d'Orbigny at Patagones, Patagonia [=Carmen de Patagones], not far from the type locality, and probably part of the original series, are definitely *pastillarius*, not *spatulatus*. The larger of these specimens is very worn (no coating, no hairs on the tarsi, some tarsi missing, teeth of the front tibiae worn smooth); the smaller one (only 9 mm.) is also worn and the coating has gone from most parts of the legs and pronotum, but the teeth of the front tibiae are present and they are the characteristic broad, large teeth of *pastillarius* (figs. 44-46). The size variation in this species may be one of the reasons why the smaller species (*spatulatus*) has gone unnoticed until now; some individuals of *pastillarius* are as small as those of *spatulatus*, and some, according to Burmeister, reach the length of 17 and 18 mm.

There is some variation also of other characters. Thus a few specimens have the apical spurs of the middle and hind tibiae longer, almost as long as those of *spatulatus*, and a few have the spurs of the middle tibiae much broader than others. Many individuals have the coating so thick on the pronotum that all the tubercles disappear beneath it.

The type locality, the bay, *baie*, or *bahia* of San Blas, is near the small settlement called San Blas in the southern extremity or "tail" of the province of Buenos Aires.

HABITS: Blanchard's specimens were found by d'Orbigny in the dunes near the sea.



***Trox spatulatus* Vaurie, new species**

Figures 1, 41, 47–49, 96, 98

TYPE MATERIAL: Type, male, Provincia de Buenos Aires [Argentina], in Frey Museum, Munich, and eight paratypes from Argentina in the collection of Antonio Martínez, Buenos Aires: one male, Provincia de Buenos Aires, J. Bosq, collector; four females, Necochea, Bosq, collector; two males and one specimen, with genitalia lacking, from Alta Gracia, Córdoba, March, 1943.

DIAGNOSIS: Differs from *pastillarius*, which it resembles dorsally, by having the front tibiae more deeply, sharply dentate, with their apical projection spatulate, not broadly lobed, by having longer tarsal bristles and longer tibial spurs, the legs bare, not coated, and the genitalia of the male abruptly bent (see table 2).

RANGE: Argentina (fig. 49). In addition to the type and paratypes, I have examined three females without locality data, and one male labeled “Mand. Plata” which is probably Plata in the province of Mendoza on the border of Chile.

DESCRIPTION OF TYPE, MALE: (See also

description of group for characters omitted here). Length, 10 mm. Wings apparently lacking. Male genitalia as shown in figures 96 and 98. Dorsum coated except for elevated parts.

Eyes, clypeus, antennae, elytra, scutellum (fig. 7), proepisternum, and metasternum like those of *pastillarius*. Pronotum like that of *pastillarius*, with the buffy coating sparse, so that all the tubercles, median ridges, and the “hood” are visible (fig. 41), hind angles of pronotum sharper than those of *pastillarius*. Tibiae and tarsi bare of coating, hind tibia with long black hairs on inner edge (hairs about as long as width of tibia). Middle and hind tibiae with eight or nine distinct serrations on outer edges. Front tibia (figs. 47–48) with deep serrations, the apical “tooth” or projection elongate and spatulate. Middle tibia with outer apical angle toothed like that of *pastillarius*, but apical spurs very broad and as long as first three tarsal segments combined, spurs of hind tibia long also and even broader. Tarsi of four posterior legs with tufts of dark bristles longer on inner sides, as long on hind tarsi as two tarsal segments.

VARIATIONS FROM TYPE: The length in 13

TABLE 2  
SPECIFIC CHARACTERS IN TWO SPECIES OF *Trox*

	<i>pastillarius</i>	<i>spatulatus</i>
Legs except for front tarsi	Encrusted with buffy coat	Bare and black
Front tibiae (figs. 44–48)	With large, broad scallops, outer apical “tooth” broad, lobed	With sharp, jagged, narrow teeth, outer apical “tooth” long and spatulate
Middle and hind tibiae	Proportionately shorter and broader, inner edge with short hairs	Proportionately longer and narrower, inner edge with very long hairs
Spurs of middle tibiae	Not longer than first two segments of tarsi	As long as first three segments of tarsi
Tarsal bristles on inner side of middle and hind tarsi	Not longer than first tarsal segment	As long as first two tarsal segments
Genitalia of male	Surface of apices of lateral lobes convex; median lobe slightly acuminate; genitalia (in profile) slightly curved to apex (figs. 95, 97)	Surface of apices of lateral lobes concave; median lobe sharply acuminate; genitalia (in profile) bent at right angles (figs. 96, 98)

specimens varies from 9 to 11 mm. In some specimens the pronotum is darker in color because of greasing, and in a few the lateral borders are more distinctly crenulate. The hairs on the inner edge of the tibiae and the serrations on the outer edge are worn down in a number of specimens; the tibial hairs are worn short in one specimen.

REMARKS: The elytra of this species and of *borrei* and *pastillarius* differ from those of all the other species of South America by having the largest tubercles on the even (2, 4, 6, 8, 10) instead of on the odd intervals; thus they have five instead of four principal rows of large tubercles. Both *spatulatus* and *pastillarius* differ further from other species of the *suberosus* group by having the inner wings vestigial as are those of the species of the *bullatus* group, but they do not have the deflexed clypeus of those of the *bullatus* group or the narrow, tongue-like, median lobe of the genitalia of the male.

For some time I thought the striking denatation of the front tibiae of *spatulatus* was only a variation of that of *pastillarius* and merely the result of wear, but after I had seen more specimens I realized that actually such denatations, when worn, tend to merge and lose their sharpness, as in figure 46, instead of becoming sharper or deeper.

All the specimens examined (five males, seven females, and one in which the sex was not determined) are uniformly constant in the characters given in table 2, except for worn tibial hairs in one specimen. In the type the extremity of the apices of the lateral lobes of the genitalia are damaged, but the genitalia are sufficiently diagnostic.

#### *Trox ciliatus* Blanchard

Figures 6, 99, 100

*Trox ciliatus* BLANCHARD, 1846, p. 190, "près du village de Patagones," Patagonia, Argentina; type not found.

DIAGNOSIS: The truncate, not angulate, deflexed portion of the clypeus and the deep metasternal depression are unique in this species. The pronotum, with its ciliate, strongly explanate sides and spongy base, the hairy head, and the male genitalia, are almost the same as those of *candezei*, but *ciliatus* differs from it by having only a submarginal carina, not four carinae, on each elytron. Both species

differ from other species of South America in the carinate elytra and the kind of pronotum, and by having exceedingly long golden hairs on the tibiae and tarsi.

RANGE: Argentina and Bolivia. (For data on the 29 specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 12 to 15 mm. Wings long. Dorsum with short hairs but bare of coating, except for spongy area at base of pronotum. Male genitalia specifically distinct (figs. 99, 100).

Head bare of coating and finely punctate, its tubercles distinctly transverse, joined together. Clypeus rounded-truncate in front, the edge turned down, this deflexed part truncate, impunctate, very short, of the same length as the reflexed part above (or behind) it. Antennae like those of *suberosus*. Pronotum with dorsum densely punctured, hairy, with vague longitudinal furrow at middle but no ridges or tubercles; base lobed in front of scutellum and covered with spongy tomentosity; lateral margins ciliate (hairs as long as scutellum is wide), sides broadly explanate, widening broadly to right-angled hind angles, thence perpendicularly to base. Elytra with humeral callus prominent, a blunt, distinct carina reaching from outer edge of callus to beyond middle of elytra, remainder of elytra subcostate, shining, costae feebly tuberculate, surface covered with tiny yellow hairs emerging from minute spicules; margin of elytra not crenulate, but ciliate (hairs about as long as scutellum); marginal interval not tuberculate, but with small spicules. Propisternum ciliate on outer edge and on inner front edge (elevated plaque on inner edge much wider than that of *suberosus*). Metasternal depression as long as that of *suberosus* but much deeper, the sides of depression at base markedly raised above the surface. Tibiae and tarsi bare of coating, middle and hind tibiae on outer edges finely serrate and ciliate, on under side with very long hairs, hairs of hind tibia long on three sides (hairs as long as tibia is wide), middle tibia with only a line of hairs, its outer apical angle sharply obtuse. Hairs of hind tarsi about three times or twice as long as length of individual tarsal segments. Front tibia very wide and stout, outer tooth submedian.

REMARKS: Burmeister (1876, p. 265) placed this distinctive species and its relative, *candezei*, in a group he called *Lagopelus*, which he said was characterized by the angular lobe at the middle base of the pronotum, the sagittate shape of the scutellum (fig. 6), and the broad, compressed, long-haired tibiae. Of these characters, the last seems to me to be the only one that is not shared by other species than these two. The distinct dorsal hairs present in both species on a shining, not tomentose, surface are not found elsewhere among South American species except for *pedestris* (see diagnosis of that species). *Trox ciliatus* is apparently more common than *candezei*, but it is not abundant. Some specimens of *ciliatus* have the bases of the alternate intervals of the elytra somewhat carinate.

The type locality, Patagones, is south of Buenos Aires and south of Bahia Blanca; it is also called El Carmen de Patagones. I have seen three specimens from "Patagones, 1834, d'Orbigny" in the Oberthür collection of the Paris Museum, which are probably a part of, or the entire, original series, as it was from the specimens of d'Orbigny's voyage that Blanchard described his *Trox*.

HABITS: Blanchard says that this species hides in the sand, or digs under carrion.

#### *Trox candezei* Harold

Figures 99, 101

*Trox Candezei* HAROLD, 1872, p. 113, "Pampas" [Argentina]; type not found in Paris; possibly in museum in Brussels.

DIAGNOSIS: As can be seen in the comparative description below, there are very few differences between this species and *ciliatus*, but the characters of the clypeus, the elytra, the metasternum, the hind tibiae, and the male genitalia are specific. Both species differ from others of the group, as stated in the diagnosis of *ciliatus*.

RANGE: Argentina. (For data on the four specimens examined, see Appendix.)

DESCRIPTION: (See description of group for characters omitted here). Length, 9.5 to 10 mm. Wings long. Dorsum with short hairs, but bare of coating except for spongy area at base of pronotum. Male genitalia specifically distinct (figs. 99, 101).

Head, clypeus, antennae, and pronotum like those of *ciliatus*, except for front of clypeus which is rather rounded and is not deflexed. Elytra like those of *ciliatus*, except for presence of four carinate costae instead of one costa, on each elytron, as follows: the third, fifth, and seventh intervals carinate, seventh curving outward to meet submarginal costa at base of humeral callus, or first interval carinate instead of seventh. Proepisternum like that of *ciliatus*. Metasternal depression as long as second and third abdominal segments, not nearly so deep as that of *ciliatus*. Legs like those of *ciliatus*, except for presence in male of *candezei* of series of four or five small tubercles on inner apex of hind tibia.

REMARKS: Although Burmeister (1876, pp. 258-259) considered this species to be merely an individual variation of the larger *ciliatus*, and although the authors of various catalogues have followed his opinion, I believe that the two are distinct, as can be seen from the diagnosis and description above. The short tubercular keel on the inner apices of the hind tibiae in the two males of *candezei* that I have examined is not present in the only female available for inspection, nor is it present in males or females of *ciliatus*. The elytra, on the other hand, are not always completely distinct, because some individuals of *ciliatus* have more than one carina (but at base of the elytra only), and some of *candezei* (a specimen from Santiago del Estero) have one of the four carinae obsolete. The lateral lobes of the male genitalia are more sinuous in *candezei* and approach each other at the base (fig. 101).

HABITS: The only specimen Harold had of this species was sent to him by Candèze from Liège, Belgium, where it had been found in wool sent to the Belgian factories from the pampas of Argentina.

#### SPECIES GROUP *batesi*

The single South American species placed in this group resembles the species of the *suberosus* group in the kind of male genitalia and in the horizontal position of the clypeus. It differs, however, by having the clypeus uniformly smooth, without a thickened margin or furrow in front, the sides of the scutellum parallel, not constricted at the base or sagittate, and the elytra smooth, without tubercles

or carinae. The metasternum is somewhat shorter (wings slightly reduced) than that of the species of the *suberosus* group, except for *pastillarius*. The group differs from the *scaber* group as stated in the diagnosis of *T. scaber*.

***Trox batesi* Harold**

Figures 10, 49, 102

*Trox Batesi* HAROLD, 1872, p. 126, "Amazon-strom" [Amazonas, Brazil]; type in Paris Museum, examined.

**DIAGNOSIS:** Differs from all other species in South America by having no tubercles or raised parts whatsoever on the elytra, the intervals being flat, glabrous, and lightly punctate. It resembles *eversmanni* Krynicki from Asia and *striatus* Melsheimer from the United States in the general aspect of the elytra, but differs from them by having no hairs emerging from the punctures or from the margins, and a pronotum of different shape.

**RANGE:** Brazil, Paraguay, and northern

Argentina (fig. 49). (For data on the 11 specimens examined, see Appendix.)

**DESCRIPTION:** Length, 9 to 10 mm. Wings not quite full, about as long as entire beetle. Male genitalia specifically distinct (fig. 102). Dorsum glabrous except for lateral borders of pronotum and elytra which have a brownish coating.

Head with two elongate, oblique, slightly tomentose tubercles. Clypeus horizontal, obtusely angulate in front, sparsely punctate; suture visible laterally. Antennae with funicle inserted under overhanging scape, not at tip, scape and its hairs red; club only one-half of the length of scape. Eyes large and bulbous. Pronotum densely and finely punctured, glabrous except for lateral tomentose borders, smooth except for slightly depressed median furrow extending from base to apex, and for three round depressions (the inner basal one very deep) on each side; base drawn backward strongly in front of scutellum; lateral margins feebly ciliate, not emarginate, widening to behind middle, thence converging obliquely to base (shape about as in fig. 39 of *loxus*). Scutellum shield-shaped (fig. 10), scarcely longer than wide. Elytra glabrous except for lateral tomentose margin; all intervals flat, of equal width, and finely punctate; striae with punctures almost as large as intervals are wide; humeral callus present, sub-apical callus obsolete. Proepisternum with disc glabrous, sparsely punctured. Metasternal depression not quite so long as second and third abdominal segments combined and not quite so long as wide. Tarsi and front tibiae shining. Middle and hind tibiae coated except for inner edge, their outer edges not toothed or serrate, inner edges sparsely ciliate. Front tibia with acute submedian tooth on outer side. Middle tibia with outer apical angle rounded or obtuse. Hind tarsus not quite three-quarters of length of tibia.

**REMARKS:** Harold (1872, p. 126) states that *batesi*, although it differs in sculpture from the majority of species in the genus, bears some resemblance to *ciliatus*, *eversmanni*, and *striatus* (see the diagnosis above). The two last-named species, as well as the somewhat similar *scaber*, are much smaller than *batesi*, and differ further from it by having no tubercles on the head, the scutellum elongate oval, the sides of the pronotum subparallel,



FIG. 49. Distribution of *Trox batesi*, *T. pastillarius*, and *T. spatulatus*.

not angulate behind the middle, the tibiae serrate, the elytra with a tiny ledge or tooth at the angle of the humerus, and a different kind of male genitalia with a large basal piece. *Trox ciliatus*, on the other hand, is much larger than *batesi*; but it resembles *batesi* (as does also *candezei*) by having punctures and a median furrow on the pronotum, the pronotum without tubercles or ridges, the dorsum smooth and shining, and the male genitalia of the same general type. These two species differ notably from *batesi* by having the dorsum and margin of the elytra, as well as the tibiae and tarsi, pubescent, the sides of the pronotum abundantly ciliate, the elytra carinate, and the scutellum angulate at the sides.

The inner wings were examined on only one specimen, a male from Amazonas in the collection of the United States National Museum. This species may be in the process of losing its wings, as the wings are not of full length. The metasternum is not so short, however, as in species with more reduced wings, and the humeral callus of the elytra is rather intermediate between fully winged species and those with abbreviated wings.

This species is apparently fairly rare.

#### SPECIES GROUP *scaber*

*Trox scaber* is the only species of its group occurring in South America. Six other small species (*aequalis*, *affinis*, *atrox*, *fascifer*, *laticollis*, and *striatus*) from the United States, Canada, or northern Mexico, were placed in this group by Vaurie (1955, p. 19; characters of the group, p. 20).

#### *Trox scaber* (Linnaeus)

Figures 103, 104

*Silpha scabra* LINNAEUS, 1767, p. 573, "Europe," type not found.

*Trox trisulcatus* CURTIS, 1845, p. 446, Valparaiso, Chile, type in British Museum, examined.

For the European and Asian synonyms, see Vaurie, 1955, p. 28, or any catalogue.

**DIAGNOSIS:** Differs from other species in South America by being smaller (5 to 7 mm.), by having transverse setae on the head instead of tubercles, the pronotal sides subparallel (except where they converge slightly apically) and contiguous basally with the

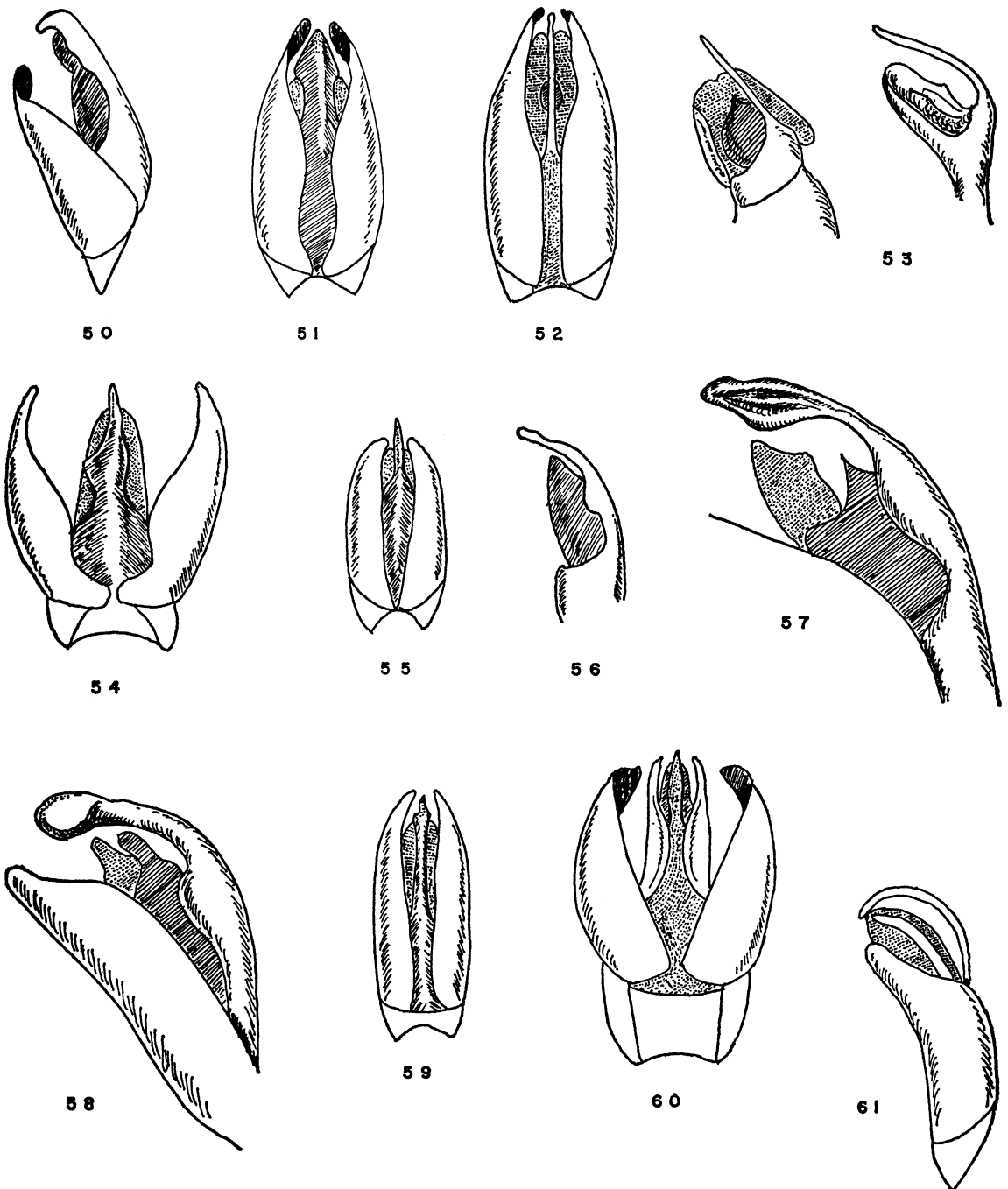
elytra, the humeri of the elytra with a tiny, transverse ledge at the base on the outer side, the proepisternum long and narrow, not angulate on the inner edge and without a plaque on the inner side in front, and the male genitalia with the basal piece longer than the lobes.

**RANGE:** Argentina and Chile in South America; Canada and the United States in North America; Japan; and, according to Balthasar (1936), Europe, North Africa, the Canary Islands, Siberia, and Australia. In the Western Hemisphere, the species is not reported from the Antilles, Mexico, Central America, or central and northern South America. (For data on the 20 South American specimens examined, see Appendix.)

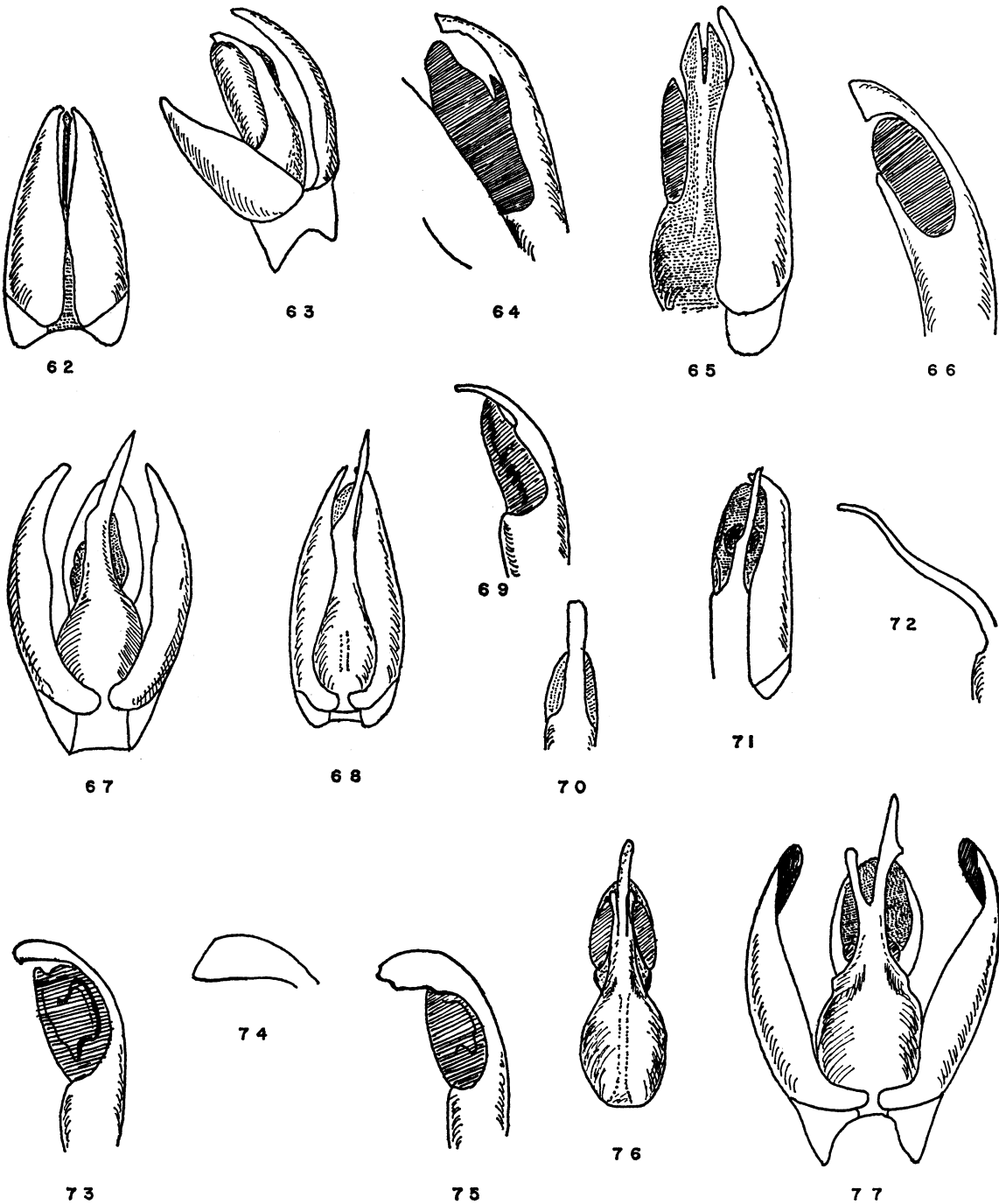
**DESCRIPTION:** Length, 5 to 7 mm. Wings long. Male genitalia specifically distinct (figs. 103, 104). Dorsum not coated.

Head with transverse row of setae. Clypeus horizontal, more or less rounded in front except for obtuse little angle at center that turns upward, densely punctured. Antennae with funicle inserted at apex of scape, scape and hairs red; club much longer than scape. Eyes large and bulbous. Pronotum densely punctured, smooth, but with median depression at base, and two round lateral depressions; base feebly drawn backward in front of scutellum; lateral and basal margins densely ciliate, subparallel, hind angles rectangular, resting on humeri of elytra. Scutellum elongate. Elytra with intervals flat but third and fifth often feebly elevated at base, of about equal width; punctate striae with two longitudinal, parallel ridges (or capillary lines) connecting the punctures; even intervals with tufts of from two to five yellowish setae, odd intervals (3, 5, 7, 9) with more elongate patches of 10 or 12 setae; humeral and subapical calluses present, humerus with ledge hidden under angles of pronotum; marginal interval smooth; margin densely ciliate. Proepisternum with disc smooth. Metasternal depression long. Legs not coated. Middle and hind tibiae serrate on outer edges. Middle tibia with outer apical angle not toothed. Front tibia with subapical outer tooth. Hind tarsus about three-quarters of length of tibia.

**REMARKS:** The elytral intervals are flat and equal in width, as are also those of *batesi*, but

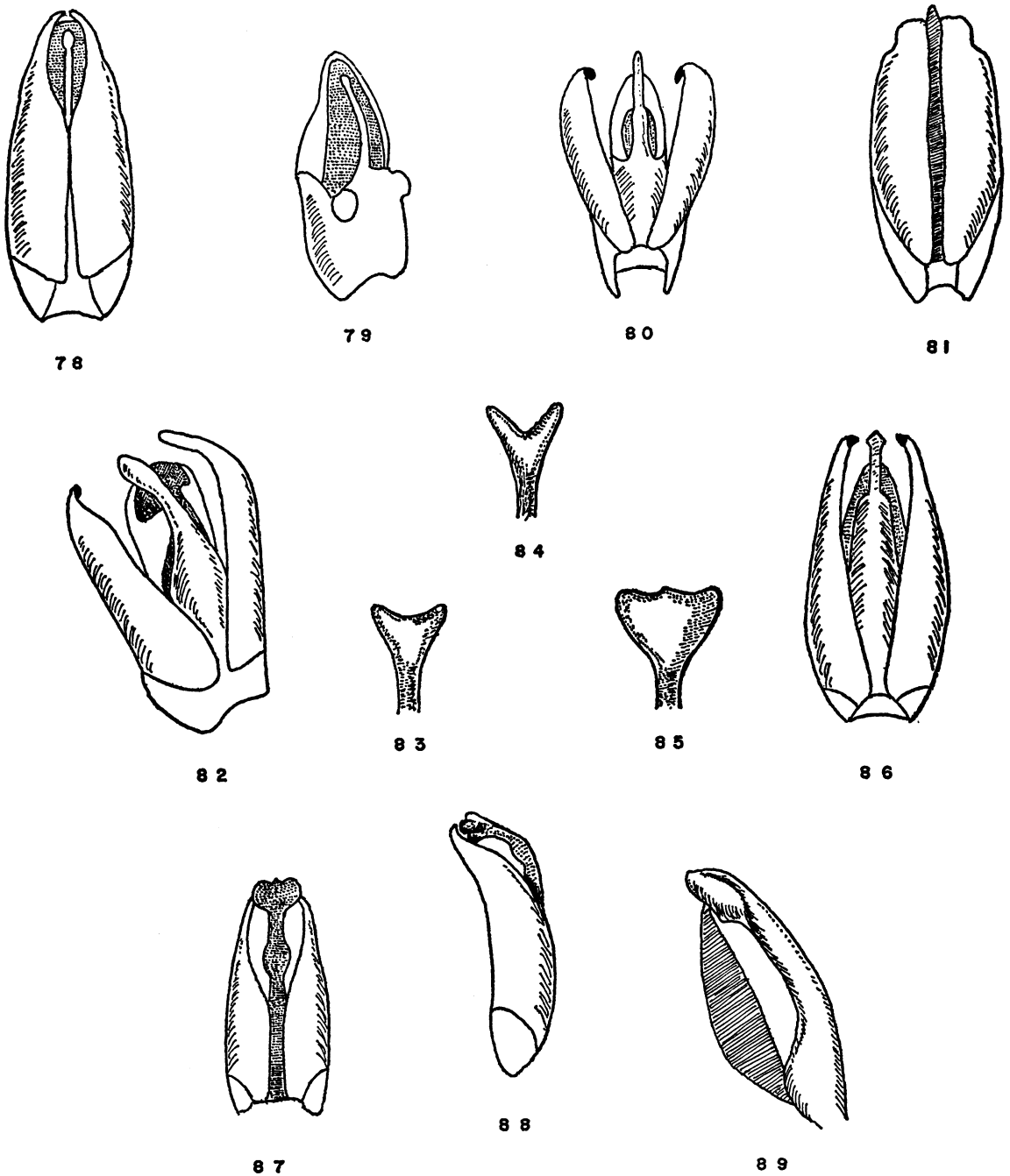


FIGS. 50-61. Male genitalia of *brevicollis* group. Dorsal views unless stated otherwise. 50. *Trox brevicollis*, profile. 51. *T. brevicollis*. 52. *T. aeger*. 53. *T. aeger*, enlarged views of median lobe. 54. *T. gemmifer*, enlarged view, lateral lobes open. 55. *T. gemmifer*. 56. *T. gemmifer*, enlarged profile of median lobe. 57. *T. haafi*, enlarged profile of median lobe. 58. *T. neuquen*, enlarged profile of median lobe. 59. *T. neuquen*; characteristic also of *T. haafi* and *T. hemisphaericus*. 60. *T. guttifer*, lateral lobes open. 61. *T. guttifer*, profile.

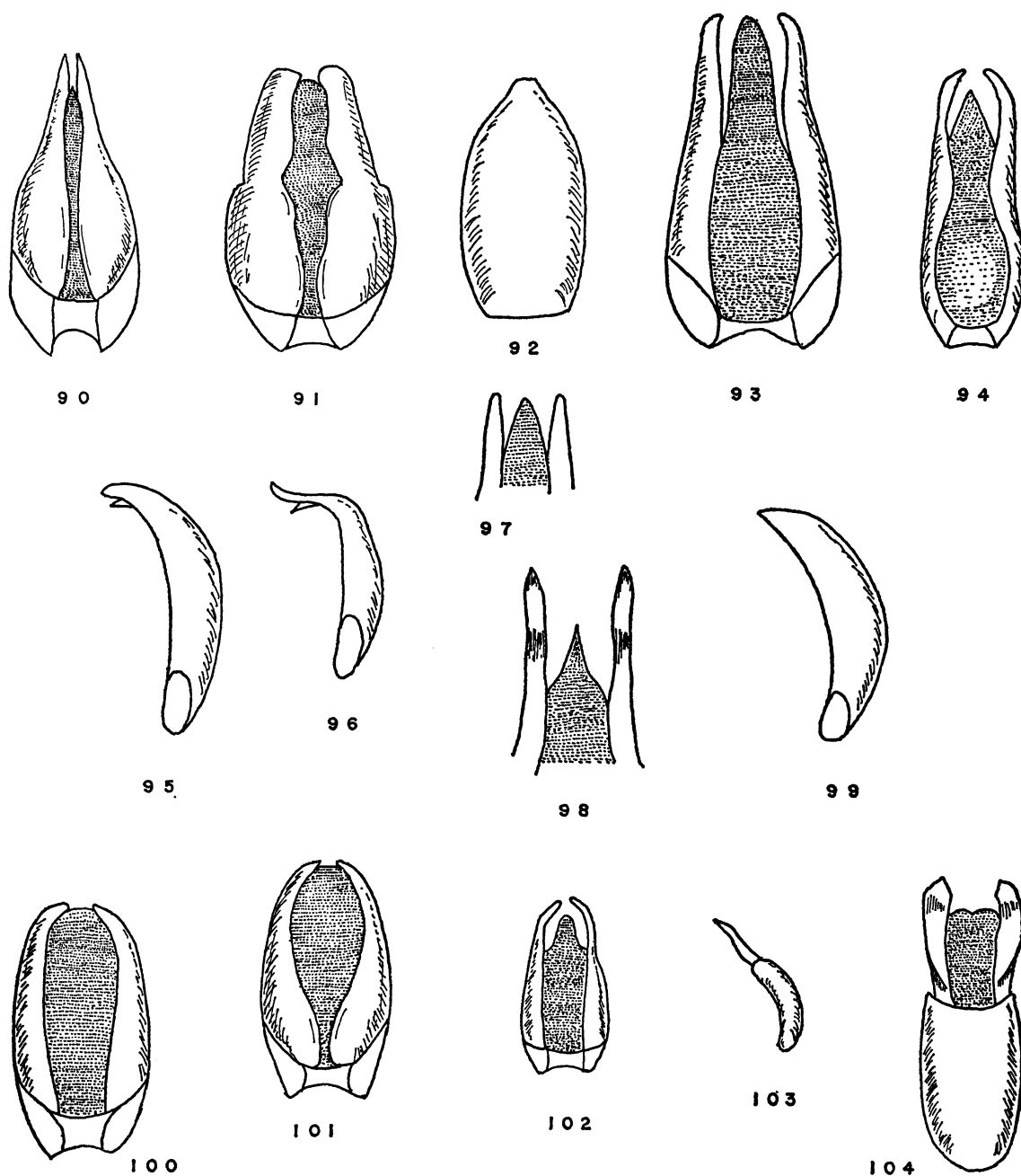


FIGS. 62-77. Male genitalia of *brevicollis* group. Dorsal views unless stated otherwise. 62. *Trox peruanus*. 63. *T. peruanus*, three-quarter view. 64. *T. peruanus*, enlarged profile of median lobe. 65. *T. aricensis*, showing removal of one lateral lobe. 66. *T. aricensis*, enlarged profile of median lobe. 67. *T. pilularius*, lobes open; characteristic also of *T. brasiliensis*. 68. *T. pilularius*; characteristic also of *T. brasiliensis*. 69. *T. pilularius*, enlarged profile of median lobe; characteristic also of *T. brasiliensis* and *T. gemmingeri*. 70. *T. gemmingeri*, enlarged apex of median lobe. 71. *T. seymourensis*, showing removal of one lateral lobe; characteristic also of *T. galapagoensis*. 72. *T. seymourensis*, enlarged profile of "tongue" of median lobe; characteristic also of *T. galapagoensis*. 73. *T. sallei*, enlarged profile of median lobe. 74. *T. tenebrosus*, enlarged profile of apex of median lobe. 75. *T. ecuadorensis*, enlarged profile of median lobe. 76. *T. sallei*, median lobe; characteristic also of *T. tenebrosus* and *T. ecuadorensis*. 77. *T. bifurcatus*, enlarged view, lobes open.





FIGS. 78-89. Male genitalia of *brevicollis* and *bullatus* groups. Dorsal views unless stated otherwise. 78. *Trox pedestris*. 79. *T. pedestris*, enlarged three-quarter view of median lobe. 80. *T. longitarsis*, lateral lobes open. 81. *T. longitarsis*. 82. *T. chilensis*, three-quarter view, lateral lobes open; when lobes closed resembles figure 78. 83. *T. bullatus*, enlarged apex of median lobe (Chile). 84. *T. bullatus*, enlarged apex of median lobe (Argentina). 85. *T. patagonicus*, enlarged apex of median lobe. 86. *T. patagonicus*; characteristic also of *T. bullatus*, except for shape of apex of median lobe. 87. *T. pampeanus*. 88. *T. pampeanus*, profile. 89. *T. hemisphaericus*, enlarged profile of median lobe.



FIGS. 90-104. Male genitalia of *suberosus*, *batesi*, and *scaber* groups. Dorsal views unless stated otherwise. 90. *Trox suberosus*. 91. *T. persuberosus*. 92. *T. persuberosus*, median lobe. 93. *T. loxus*, enlarged view. 94. *T. borrei*, enlarged view. 95. *T. pastillarius*, profile. 96. *T. spatulatus*, profile. 97. *T. pastillarius*, enlarged view of apices. 98. *T. spatulatus*, enlarged view of apices. 99. *T. ciliatus*, profile; characteristic also of *T. candezei*. 100. *T. ciliatus*, enlarged view. 101. *T. candezei*, enlarged view. 102. *T. batesi*. 103. *T. scaber*, profile. 104. *T. scaber*, enlarged view.

*scaber* has, in addition, tufts of setae on the intervals that are lacking in *batesi*. The other characters mentioned in the diagnosis show that *scaber* differs radically from South American species. It is probably a Palearctic species that has been carried in fur, feathers, bones, or wool to other parts of the world, including southern South America. Although described from Europe, it seems to have more affinity with species from the United States (*aequalis* and allies) than with *perlatus* and other European species. In the United States it is found principally in the northern states.

Arrow (1909, p. 501) said Curtis' type of *trisulcatus* represented "the very common and widespread species, *T. scaber* L."; I have also seen the type and agree with Arrow.

**HABITAT:** According to Strand (1959, p. 47) *scaber* is found in the nest of the hawk *Buteo buteo* Linnaeus. It occurs also in the nests of other birds and of rodents and small mammals where it feeds on the hairs, feathers, or bones. It was reported by Candèze (1870-1871) in shipments of sheep's wool sent from Argentina to Belgium. (See also Vaurie, 1955, p. 29.) *Trox niponensis* Lewis (1895) from Japan (a synonym of *scaber*) was "taken from a dead animal on the sandhills" of Hakodate, on the island of Hokkaido.

#### INCERTAE SEDIS

*Trox chevrolati* Harold, 1868 (type locality, Cuba), is mentioned here because, even though Harold in 1872 synonymized *chevrolati* with *perlatus* Goeze, a European species, and Balthasar (1936) considered it also a synonym of *perlatus*, the catalogue of Blackwelder (1944) lists *chevrolati* as a separate species but with a question, "?Cuba." Harold included Cuba in the range of *perlatus*, but Balthasar and Arrow (1912) made no mention of Cuba. If the locality is correct, then

*perlatus* and *chevrolati* should have been listed by Vaurie (1955) with the other Cuban species (*insularis* and *tytus*), but if, as I suspect, the locality is in error, then *chevrolati* should be removed from future catalogues of the Western Hemisphere.

#### *Trox torpidus* Harold

*Trox torpidus* HAROLD, 1872, p. 58, Buenos Aires [Argentina]; type probably in Vienna.

This appears to be a North American species and a synonym of either *Trox punctatus* Germar, 1824, or *T. texanus* LeConte, 1854. Harold, when he described *torpidus*, questioned the locality of the single specimen he saw in the Vienna Museum because no further specimens had been found in Argentina and because *torpidus* seemed to him more similar to species found farther north, and he mentioned *scutellaris* Say, *punctatus* Germar, and *suturalis* LeConte (a synonym of *texanus*). Burmeister (1876, p. 263) also questioned the locality, saying that *torpidus* did not occur in Buenos Aires. The species is listed by Arrow (1912, p. 62) in the Junk catalogue and by Blackwelder (1944, p. 219) in his catalogue as being from "?Central America."

The diagnostic characters given by Harold are that his specimen is large (15 mm.), has the ridges and tubercles of the pronotum well marked, the hind tibia not denticulate, the humeri "rounded," the pronotum distinctly lobed at the base, and the scutellum short and arrowhead- or lance-shaped. The two last-named characters are not present in *scutellaris*; therefore *torpidus* is not that species. It is difficult to say with certainty with which of the other species *torpidus* is synonymous. Harold, however, had seen the type of *punctatus* and did not know *suturalis* or *texanus* of LeConte.

## APPENDIX: SPECIMENS EXAMINED

FOR CONVENIENCE, the species, as well as the countries under each species, are listed alphabetically. The notation of sex means that the specimen or specimens have been dissected.

### *Trox aeger* Guérin

*Argentina*: Buenos Aires, 10; Catamarca, Yunka Suma (Reitter), 2; Corrientes, 1; La Plata, 11. Buenos Aires: 1; Flores, 1; Villa Real, 1; Zarate, 1. *Brazil*: 1; Alto da Serra, 1. Rio Grande do Sul: 1; Pelotas, 1. Santa Catarina: Lages (Fruhstorfer), 1. *Chile*: 5. *Paraguay*: 6. *Peru*: 1. *Uruguay*: 2; Cerro Largo, 1; Montevideo, 6.

### *Trox aricensis* Gutiérrez

*Argentina*: Jujuy: 1; La Quiaca, Feb., 1951, 3442 m., 1 ♂. La Rioja, 2 ♂, 2 ♀; Catamarca, 1. Tucuman: Famaila (Newmann), 1 ♂; Abras del Infernillo, 3000 m., 1 ♂. *Bolivia*: 3; Oruro, 3700 m. (Wittmer), 2; Guaqui, Feb., 1949, 3850 m., 1, 1 ♂; Plateau of Puna, 13,000 ft. (Bandelier), 1. La Paz: Sicasica, 13,000 ft. (Bandelier), 1 ♂. Cochabamba: 1889 (Germain), 3; Vacas, 3. Santa Cruz: Buena Vista, 1. *Chile*: Santiago, 2. Arica: Putre, Jan., 1948, 1 ♂; Feb., 1948, 3650 m. (Gutiérrez), 2 [paratypes]. *Peru*: Oroya (Beck), 3 ♂, 2 ♀; "Lima?" (Soukup), 1.

### *Trox batesi* Harold

*Argentina*: Salta: Distrito de Oran: Urundel (Monros), 1; Distrito de San Martin: Pocitos, 1 ♂. *Brazil*: Espirito Santo, 1. Rio de Janeiro: Rio Preto, Campos (Alvarengo), 1. São Paulo: Marília, 1 ♂. Amazonas: Itaituba, 1; Manaus (Ohaus), 1 ♂; Tefé (M. de Mathan), 1. "Amazonstrom": 1 [type]. *Paraguay*: 1 ♀; Chaco (Fiebrig), 1 ♀.

### *Trox bifurcatus* Vaurie, new species

In addition to the type from Sara, Bolivia, the following specimens have been examined:

*Argentina*: Salta: Rio Salado, 1; Tablillas (Harrington), 1. Misiones: [Puerto] Iguazu (Amigo), 1. Chaco: Resistencia Ciudad, 2. *Bolivia*: Paratypes: Reyes, Oct., 1921–1922 (W. M. Mann), 1; Tiguipa, April, 1922 (Harrington), 1; Buenavista, Nov., 1948 (Pereira), 1 ♂. Sara Province: Sara (J. Steinbach), 10. Santa Cruz de la Sierra, 500 m., "I-IV-1904" (Steinbach), 1, 1 ♂; Santa Cruz, Feb., 1956 (Pinckert), 2, Nov., 1925, 1. Not paratypes: *Brazil*: 1. Mato Grosso: 4; Murtinho (Spitz), 2. Santa Catarina: 2; Corupa (Hansa Humboldt), 2. Bahia: Bahia, 3. São Paulo: (Hammer), 1; Ypiranga, 4; Rio Parana, Porto Cabral, 2 ♂. Parana: Castro, 1. Minas

Geraes: Sabara-Bello Horizonte, Rio das Velhas, 1. Rio de Janeiro: Petropolis, 1 ♂, 1 ♀. *Paraguay*: 9; Alto Parana, Hohenau, 1; Horqueta, 2; Sierra Trinidad, 1; San Bernardino, 1, 1 ♂; Colonia Nueva Italia (Willim), 1; Ipane River, Chaco, (Schulze), 1; Gran Chaco, 1 ♂.

### *Trox borrei* Harold

*Argentina*: Patagonia, 1; Rio Salado, 1; San Vicente near Cordova, 1, 1 ♂. Santiago del Estero: 3. Misiones: Santa Maria (Viana), 1. Corrientes: 1834 (d'Orbigny), 2; Bords du Parana, Bella Vista (Wagner), 1. *Bolivia*: Villa Montes on Rio Pilcomayo (Eisentraut), 1 ♀; Camiri (Maldonado), 1 ♂. *Brazil*: 1 [type of *badeni*]; Pernambuco, 1 ♀; Mato Grosso: 1886 (Germain), 1. *Paraguay*: San Bernardino (Eisenlohr), 1 ♂, 1 ♀; Villa Florida (Podtiaguin), 1. *Uruguay*: 1; Montevideo, 1 [type of *borrei*].

### *Trox brasiliensis* Vaurie, new species

In addition to the type from Ypiranga, São Paulo, the following specimens have been examined:

*Brazil*: Paratypes: São Paulo: (Hammar), 1, (Metz), 1, (Fischer), 2; São Paulo, Ypiranga, Dec. 2, 1923, 1, Oct., Nov., Dec., 1937 (Lane), 5, Mar., 1909, Dec., 1912, (Luederwald), 6, Dec., 1937 (Cardoso), 1, Nov.–Dec., 1937 (L. de Morretes), 1 ♂, 4 ♀, 4; São Paulo, 987 Rua Maestro Cardim, 1. Not paratypes: Goyaz: Campinas (Spitz), 3; Leopoldo Bulhões (Spitz), 1. Santa Catarina: Corupa (Maller), 2; Rio Vermelho (Maller), 1; Rio das Antas (Camargo), 6; Nova Teutonia, 4, (Plaumann), 3; Lages, 1887 (Michaelis), 1. Parana: Curitiba (Lange), 1. *Paraguay*: Sierra Trinidad, 1; Alto Parana, Hohenau, 1.

### *Trox brevicollis* Eschscholtz

*Argentina*: Neuquen: (Lendl), 3; Isla Victoria, Lago Nahuel Huapi, 1; Chapelco, 3. Bahia Blanca (Darwin), 1. *Brazil*: 2. *Chile*: 33; Pemehue (Gutiérrez), 2; Llifén (Guzman), 10; Maipu (Ibarra), 1; Chiloe, 2; Villarica (Löffler), 2; Valparaíso, 4 [including type of *lachrymosus*]; Valdivia, 2; 50 km. east of San Carlos, Nuble (Ross and Michelbacher), 1; 10 miles northeast of Pucon (Ross and Michelbacher), 1; Freire, 1; Fonck, 10; Santiago, 3; Leyda, Santiago, 2; El Canelo, Santiago, 1; El Abanico, Bio-Bio (Ross and Michelbacher), 1 ♂, 2; Curacautin, 1 ♂; crest of Sierra Nahuelbuta, west of Angol, 1; Angol, 1 ♂, 2 ♀, 7. Concepcion: 3; Contulmo, 37. *Peru*: Callao, 1; Payda (?), 1.

**Trox bullatus** Curtis

*Argentina*: Buenos Aires: Distrito de Olavaria: C[erro] Redondo, Apr., 1947 (Monrós), 5 ♂, 3 ♀; Zarate, June, 1946 (Monrós), 1 ♂. *Bolivia*: 1. *Chile*: 26; Santiago, 9; Valparaiso, 6 [including type]; Coquimbo, 3; Penalolen [not located], June, 1953, 6; Concepcion, 4; Tofo [not located], May, 5, 1 ♂, May, June, 1917 (Hallinan), 4 ♂, 2 ♀, 3. Santiago: El Canelo, Oct. 1950, 1; Apoguindo, June, 1949, 1. Viña del Mar, Mar., 1938, 2; Quellon, Chiloe Island, Feb., 1923, 1. Atacama; Domeyko, Aug., 1923, 2. Maullin, Oct., 1940 (Gutiérrez), 2; Mineral [not located], 1 ♀; Bosque de Fray Jorge [not located], Sept., 1947 (Peña), 1 ♂, 1 ♀, 1. *Peru*: 1. *Uruguay*: Montevideo, 1, 1 ♂.

**Trox candezei** Harold

*Argentina*: 1 ♀; Cordoba, "12-9-1914," 1 ♂. Santiago del Estero: Rio Salado, 1 ♂. Patagones, 1834 (d'Orbigny), 1.

**Trox chilensis** Harold

*Chile*: 1 ♂, 1 ♀, 7 [including type]. Osorno: 30 km. west of Purranque, Jan., 1951 (Ross and Michelbacher), 1 ♂. Santiago, 1 ♀. Concepcion: Contulmo, 1, (Maller), 1 ♂.

**Trox ciliatus** Blanchard

*Argentina*: Patagonia, 6; S. Vicente near Cordoba (Frenzel), 1; Neuquen, 1 ♂, 1 ♀. Neuquen: Zapala (Monros), 1, 1 ♂. San Juan de Cuyo [not located], 1; Rio Negro, 2; Mendoza, 1; Patagones, 1834 (d'Orbigny), 3. Rio Negro: Rio Colorado, Dec., 1930, 8. Santiago del Estero: 1; La Banda, 1. *Bolivia*: 1 ♂.

**Trox diffuens** Vaurie, new species

*Chile*: Santiago: Leyda, June, 1948, 1 ♀ [type].

**Trox ecuadorensis** Vaurie, new species

*Ecuador*: (See under the species in the text).

**Trox galapagoensis** Van Dyke

*Ecuador*: Galapagos archipelago: Culpepper Island [Darwin], Sept., 1905 (Williams), 1 ♀ [type], "12-10-1898," 1 ♂, 1 ♀; Wenman Island [Wolf], 200 ft., 1 elytron.

**Trox gemmifer** Blanchard

*Argentina*: 10. Buenos Aires: Estancia Barrou, 30 km. south of Villa Iris, 1 ♂; Distrito de Puan: Felipe Solá, 4 ♂, 3 ♀, 5. Santiago del Estero: Chaco, Rio Salado, 300 m., 1 ♂. La Pampa, Nov., 1939 (Reed), 1 ♂, 2 ♀, 4; Mendoza, 1 ♂, 10. Mendoza: Santa Rosa (Jensen-Baarup), 2. Neuquen, 1 ♂, 1 ♀, 2, (L. Adolf), 4 ♂, 1 ♀, 4; Tucuman, 2 ♂, 1 ♀; La Rioja (Reed), 1; Cordoba (Stempelmann), 1, (Lorentz), 1 ♂ [type of *argen-*

*tinus*]; Bahia Blanca, 3 ♂, 1 ♀, 3; Chilecito, 1; Patagonia, 1; Rives du Rio Negro, 1897 (de la Vaulx), 1. *Brazil*: Santa Catarina, 1 ♂. *Chile*: 1.

**Trox gemmingeri** Harold

*Argentina*: Buenos Aires, 6, Dec., 1954, 1, (Schimpf), 1 ♂. Buenos Aires: Olivos, Nov., 1951, 7. Catamarca, Yunka Suma (Reitter), 1; Cordoba, 1 ♂, 2, Jan., 1934 (R. Maniglia), 2, (J. Franzel S.), 1. Cordoba: Capilla de Monte (Hosseus), 1; Leones (Partridge), 1; Alta Gracia, 1. Tucuman, Ciudad Universitaria, Feb., 1959 (Clarke), 1. Misiones: Loreto (R. Costa), 1. Santiago del Estero: Sumampa (Prosen), 2. *Bolivia*: 1 ♂, 1 ♀, 4; La Paz, 3650 m., 1; Buena Vista, Nov., 1948, 3; Yungas, 1 ♂, 3; Cochabamba, 1889 (Germain), 4; Chaco, Yungas, 3000 m. (Garlepp), 4. *Brazil*: 1 ♀, 3; Caraca, 1884 (Germain), 5; Quéluz (Germain), 1. Rio Grande do Sul: Pelotas, 1; Canoas, Puerto Alegre, 3. Parana: 1 ♂, 2; Castro, 1 ♀, 2; Ponta Grossa, Mar., 1937 (Machago), 2 ♂, 1. Bahia: Villa Nova (E. Garbe), 1 ♂. Santa Catarina: 1 ♂, 1 ♀. Goyaz: 1 [type], "Ex Musaeo H. W. Bates, 1892," 1. Minas Geraes: Sabara-Belo Horizonte, Rio das Velhas (Chalmers), 1 ♀. *Paraguay*: "Col. Carlos Pfnnl.," 1. *Peru*: Chanchamayo, 1 ♂. *Uruguay*: Dolores (Breuer), 2; Puente l'Este, 1 ♂; Artigas, 2.

**Trox guttifer** Harold

*Argentina*: Mendoza, 5; Patagonia, 4; Neuquen, 1 ♀, (L. Adolf), 2 ♂, 5 ♀, 5; Teutonia, 1; Salta, 1. Chubut: 2; Puerto Madryn, Mar., 1923 (Harrington), 1; Rio Colorado, 1 ♂. Rio Negro: Conesa, Jan., 1931, 2. Neuquen: Zapala (Monros), 2 ♂, 2. *Chile*: 1. No locality, 8.

**Trox haafi** Vaurie, new species

*Argentina*: (See under the species in the text).

**Trox hemisphaericus** Burmeister

*Argentina*: Rio Santa Cruz, cotypes [not examined]; Santa Cruz, 1883 (Lebrun), 1; Carmen de Patagones, 1; Patagonia, 1; Neuquen, 3, (L. Adolf), 5. "Patagonia"=Comodoro Rivadavia: Puerto Deseado, Tehuelches (Donat S.), 1 ♂, 5; Golfe St. Georges, Coli-Huapi, 1903 (Tournouer), 2. *Chile*: Punta Arenas, type of *globulatus* [not examined]; Ultima Esperanza, Tierra del Fuego, Oct., 1952 (Rodriguez), 2.

**Trox longitarsis** Harold

*Chile*: 2 [including type], Fonck, 4. Concepcion: Contulmo, 3 ♂.

**Trox loxus** Vaurie

*Argentina*: La Rioja: Patquia (Hayward), 1 ♀. Santiago del Estero: La Banda, Oct., 1945, 1. Santa Fe: Distrito Obligado Lanteri, Oct., 1945, 1. *Brazil*: Santa Catarina: Corupa, Dec., 1945

(Maller), 1 ♂; Hansa [=Corupa], Nov., 1943, 1 ♂, Jan., 1935, 1 ♂; Marília, Nov., 1945 (Guérin), 1. São Paulo: Franca, Dec., 1911, 1. Mato Grosso: 1886 (Germain), 1; Camp Grande, Nov., 1952, 1.

***Trox neuquen* Vaurie, new species**

*Argentina and Chile:* (See under the species in the text).

***Trox pampeanus* Burmeister**

*Argentina:* "Cord. Davis," 1 ♂; Tucuman, 1 [cotype]. Buenos Aires: Bahía Blanca, 1; Distrito de Puan: Felipe Sola, Feb., 1944, 1; Estancia Barrau, 30 km. south of Villa Iris, Nov., 1946, 1. No locality: 1.

***Trox pastillarius* Blanchard**

*Argentina:* 4; Corboda, 1 ♀, 2; "Cord. Davis," 1 ♂, 1 ♀; Pampas, 1 ♀; Chubut, 1; Tucuman, 2; Catamarca, 1 ♀. Buenos Aires: 1 ♂; Estancia Barrau, 30 km. south of Villa Iris, Nov., 1946, 1. Neuquen: 1 ♂, 7; Plaza Huincul, Feb., 1947 (Muñoz), 1 ♀. Santiago del Estero: 4; Rio Salado (Wagner), 1 ♀, 3; La Banda, Oct., 1945, 1 ♂; Rio Salado, 1 ♂. Mendoza, 1; Patagones, 1834 (d'Orbigny), 3; Haut Parana, Tiju-duare near San Ignacio (Wagner), 2; Bahía Blanca, 3. La Rioja: Patquia, Mar., 1948 (Breyer), 1; Chepes, Feb., 1945 (Daguerre), 1 ♀. *Bolivia:* 4. *Chile:* 1 ♀, 7. Country?: Rosario, 1; San Carlos, 1. "Antilles S. Domingo," 1.

***Trox patagonicus* Blanchard**

*Argentina:* Tucuman, 1 ♂, 1 ♀, 2; Jujuy, 1 ♂. Buenos Aires: Bahía Blanca, 1; Carmen de Patagones, 1 ♀. Chubut (Richter), 1 ♂. Comodoro Rivadavia: Apr., 1921 (Harrington), 1 ♀; Puerto Deseado, Tehuelches (Donat S.), 2 ♂. *Brazil:* Para, 1 ♀.

***Trox pedestris* Harold**

*Argentina:* 1; Cordoba, 1 ♂, 1; S. Vicente near Cordoba (Frenzel S.), 3. Cordoba: Dolores, Dec., 1932, 2. Mendoza, 1. Catamarca: Frias, Feb., 1951 (Ross and Michelbacher), 1. Patagonia, 3; Patagones, 1834 (d'Orbigny), 3; Chilecito, 1. Santiago del Estero: Rio Hondo, Nov., 1953 (Ogloblin), 2 ♂. Salta: Lumbreras, Dec., 1954, 1 ♂. Vilelas, 1. Tucuman: "S. P. Colalao Tucuman," 1948 (Arnau), 1, 1 ♂.

***Trox persuberosus* Vaurie, new species**

In addition to the type from Ypiranga, São Paulo, the following specimens have been examined:

*Argentina:* Corrientes: Alto Parana, Ituzaingo, Nov., 1945, 1. *Bolivia:* 3. Sara: (Steinbach), 3; Depto. Santa Cruz de la Sierra, 500 m., (Stein-

bach), 2; Chaparé, 400 m. (Zischke), 1. Santa Cruz: Rio Nacaguasu (Harrington), 1; Buena-vista, Feb., 1950, 1 ♂. *Brazil:* 5. Paratypes: São Paulo: (Hammar), 1 ♂, 18; vicinity of São Paulo, 2; Batataes, 1 ♂; Cantareira (Ohaus), 1; Rio Parana, Porto Cabral, Apr., 1944, 1 ♂; Alto da Serra, Feb., 1925, 2 ♂, 1 ♀, Sept., 1933, Dec., 1928 (R. Spitz), 2 ♀; Rio Claro, Jan., 1938 (Postulantes), 1 ♀; Ypiranga (Ohaus), 1 ♀, Feb., 1910 (Luederwald), 1 ♂, Nov., 1937 (F. Lane), 1 ♂, Aug., 1910 (R. Spitz), 1 ♂, (Luederwald), 2 ♂, 2 ♀, Aug., Oct., 1937 (Lange de Morretes), 1 ♂, 1 ♀. Not paratypes: Alto, Mar., 1924, 1; Tijuca, Nov., 1937, 1; Bahía, 1 ♂, 2. Bahía: San Antonio da Barra, 1. Espirito Santo: "S. Leopoldina" (Michaelis), 1. Minas Geraes: 1; Viçosa (Mexia), 1 ♀. Santa Catarina: 2; Hansa Humboldt, 1; Nova Teutonia, 300 to 500 m., Dec., 1951 (Plaumann), 1. Rio de Janeiro: Rio de Janeiro, 1 ♀, 5; Corcovado, Nov., 1937 (Tippmann), 2; Covanca, Jacarepagua, D. F., Nov., 1956, 1. Goyaz: Campinas, Nov., June, 1936 (R. Spitz), 1 ♂, 1 ♀; Leopoldo Bulhões, Oct., 1935 (Spitz), 1 ♂; Jatahy, 1898 (Pujol), 1; Trindade, 1. *Paraguay:* 2; Alto Parana, Hohenau (Jacob), 2; Trinidad, Oct., 1948, 1. *Peru:* 1; Chanchamayo, 3, La Merced, Chanchamayo, 2 ♂. *Uruguay:* Montevideo, 1.

***Trox peruanus* (Erichson)**

*Argentina:* Jujuy: La Quiaca, Feb., 1951 (Ross and Michelbacher), 2 ♂, 4 ♀; 40 km. southwest of Tres Cruces, 1 ♀, Feb., 1951 (Ross and Michelbacher), 1 ♀. *Bolivia:* 5; Plateau of Puna, 13,000 ft. (Bandelier), 1; Vacas, 2, 3000 m. (Peña), 1; 50 miles north of Potosi, Feb., 1951, 1; Titicacasee, Huatajata, Aug., 1954, 4000 m., 5; Guaqui, 3850 m., Feb., 1949, 1; Ocotavi [not located], 3800 m., Jan., 1949, 5 ♂, 2; Oruro, 3700 m. (Wittmer), 3. *Chile:* Arica: Parinacota, 4400 m. (Gutiérrez), 2. *Peru:* 1 ♂ [lectotype], 7; Chuquibambilla, Jan., 1923 (Bullock), 5; Tuliaca, 1 ♀; Cuzco, 1 ♂; Meyen [not located], 1; Oroya, 1 ♂, 6; Lago de Junin, Mar., 1913 (Beck), 5.

***Trox pilularius* Germar**

*Argentina:* 1. Buenos Aires: Jan. to Nov., 6; Boulogne, Nov., 1941, 1; Bahía Blanca, Apr., 1923, 1; Distrito Olavarría: C[erro] Redondo, Apr., 1947 (Monros), 2; Distrito de Puan: Felipe Sola, Jan., Feb., 2; P[uer]to ? San Martín, Campo Mayo, Feb., 1945, 1. Formosa: Gran Guardia, 1. Jujuy: Jujuy, Dec., 1947, 1; Sunchal, Sept., 1921 (Harrington), 4. Santiago del Estero: Rio Salado (Wagner), 2. Tucuman: Siambon, July, 1935, 1; Tucuman, 1 ♀, 1, Jan., 1953, 1 ♀, 5. La Merced (Reimoser), 1; Cordoba (Frenzel S.), 1; La Plata, 1 ♂, 7; Rio las Garzas, Ocampo (Wagner), 1; Rio las Garzas, Sante Fe, 4. *Bolivia:* 3; Tiguipa,

Apr., 1922 (Harrington), 1; Villa Montes at Rio Pilcomayo (Eisentraut), Nov., 1930, 1; Cochabamba, 2570 m. (Hermano Julio), 3. Tarija: Yacuiba, June, 1922 (Harrington), 1. *Brazil*: 6. Parana: Curitiba (Szabo), 1; Castro (Garbe), 3; Tibagy, Nov., 1932 (Vega), 1. Rio Grande do Sul: 4; Herval (Biezanko), 1; Bom Retiro (Soyaux S.), 1. São Paulo: 2; Ypiranga, Oct., 1927 (Spitz), 1 ♂; Porto Epitacio (Ohaus S.), 1. Santa Catarina: 6; Rio Vermelho, Jan., 1945 (Maller), 1; Joinville (Ohaus S.), 1; Lages, Mar., 1887 (Fruhstorfer), 2. *Chile*: 1. *Paraguay*: 4. *Uruguay*: 4; Dolores (Breuer), 5; Montevideo, 13, Aug.-Sept., 2; Menafra, Rio Negro, Jan., 1914, 1; "R. O. del Uruguay," 1 ♂, 2.

#### *Trox sallei* Harold

*Bolivia*: 2 [including type]. *Ecuador*: Zamora, 2 ♀, 8; Loja, 2200 m., 1 ♂, 3. *Peru*: 3; Arequipa, 2500 m., Dec. (Hopp), 1 ♂, 1; Lima, 1, Apr.-May, (E. Chapin), 2. Amazonas: Chachapoyas, 1889 (de Mathan), 24.

#### *Trox scaber* (Linnaeus)

*Argentina*: Corrientes, 2. Buenos Aires: Buenos Aires, Nov., 1918, 1. *Chile*: 10; Valparaiso, 3 [including type of *trisulcatus*]; Santiago, 3, July, 1940 (Gutiérrez), 1.

#### *Trox seymourensis* Mutchler

*Ecuador*: Galapagos Archipelago: Albemarle [Isabela] Island: Apr., 1906 (Williams), 1; Villamil, Aug., 1906 (Williams), 3 ♂, 1 ♀, 49; Cowley Mt., July, 1906, 1. South Seymour [Baltra] Island, Apr., 1923, 1 [type]. Indefatigable [Santa Cruz] Island, Oct., 1935 (von Hagen), 1; May, 1959 (Foerster), 15. Tower [Genovesa] Island, Apr., 1923, 1 elytron. Floreana Island, Apr., 1959 (Foerster), 2.

#### *Trox spatulatus* Vaurie, new species

*Argentina*: (See under the species in the text).

#### *Trox suberosus* Fabricius

*Argentina*: La Plata, 1; La Rioja (Gomez), 4; Mendoza, 1; "Cord. Davis," 1; Cordoba (Reitter), 2, Dec., 1; Santiago del Estero, 1; La Pampa, Nov., 1939, 1; Chubut (Reitter), 3; Julay (Reitter), 3; Tucuman, 10; Catamarca, Yunka Suma (Reitter), 8; Rosario (Stempelmann), 2; Bahia Blanca, 1 Aguaray, Tartagal, Oct., 1920 (Harrington), 1 ♂, 5; Buenos Aires, 11. Salta: Cafayate (Reitter), 4; Guemes, 6; Embarcacion, Feb., Oct., 2; Embarcacion to Villa Montes, Mar., 3; Tartagal, May, 1924 (Harrington), 1. Chaco: Santa Fesino, Aug., Sept., 1911 (Schaditz), 4; Resistencia, Nov., 1945, 4. Buenos Aires: Distrito Olavarria: C[erro] Redondo, Apr., 1947 (Monros), 2; Distrito de Puan: Felipe Sola, Feb., 1942, 2.

"In bones from Argentina to New York," Aug., 1926, 1; "In bones from Argentina to Seattle," Dec., 1926, 1. *Bolivia*: 2; Santa Cruz, Feb., Mar., Nov., 1 ♂, 5; Buena Vista, Oct., Nov., 4; Tiguiipa, Apr., 1922 (Harrington), 2; Yoay and Mendipecua Hills, Nov., 1932 (Harrington), 1. Santa Cruz: Cambeiti, 2; Loma Alta [not located], Nov., 1956 (Pinckert), 1. *Brazil*: Santarem, 1; Lacerda, 1; Natal, Apr., 1921, 5; Ceara (da Rocha), 3; Independencia, Parahyba (Mann and Heath), 1 ♀. Rio Branco: Surumu, 1. Territorio do Acre: Porto Walter, 1. Amazonas: Tefte, Nov., 1919, 1; Para (Ohaus), 1; Manaos (Ohaus), 1. Bahia: 5; Villa Nova (Garbe), 2. Goyaz: Rio das Mortes Sept., 1934 (Pinto), 2; Rio Maranhão, Sept., 1948, 1. Parana: Londrina (Pochon), 4. Minas Geraes: Cabo Verde, Jan., 1920 (Diaz), 1; Pirapora (Garbe), 1 ♂; Sabara, 3; Irara, Jan., 1941, 1. Mato Grosso: Corumba, 1; Murtinho, Nov.-Jan. (R. Spitz), 11; Caceres, Dec., 1956, 1. Rio de Janeiro: Rio de Janeiro, 1. Santa Catarina: 1; Nova Teutonia, 10; Hammonia, Aug., 1910 (Luederwald), 1; Rio Natal, Dec., 1946, (Maller), 1 ♀; Corupa (Hansa Humboldt), Dec., 1944 (Maller), 2. São Paulo: 2; Batataes, 1 ♂; Oct., 1939, 3, Nov.-Dec., 1948 (Pereira), 2; Franca, Jan., 1911 (Garbe), 1; Campinas, 1; Anhanger, Dec., 1926 (Spitz), 1 ♂; Ribeirão Preto, 2; Alto da Serra, Feb., 1925, 1; Ypiranga, Jan.-Dec., 1 ♂, 1 ♀, 8; Marilia, Nov., 1945 (Guérin), 3. *British Guiana*: Upper Rupununi, 1. *Chile*: 1. *Colombia*: Santa Marta, 1; Latica, 1. *Ecuador*: 2; Guayquil, 7; Chanduy, 1. Galapagos Archipelago: Abingdon [Pinta] Island, Sept., 1906, 1. Albemarle [Isabela] Island: Aug., 1906 (Williams), 1, Apr., 1; Cowley Mt., Aug., 1906 (Williams), 1; Villamil, Mar., 1906 (Williams), 5. Charles [Santa Maria] Island, Apr., 1906 (Williams), 1. Chatham [San Cristobal] Island, Feb., 1906 (Williams), 1. Floreana [Santa Maria] Island, Apr., 1959 (Foerster), 3. Hood [Española] Island, Apr., 1925, 5. Indefatigable [Santa Cruz] Island, Conway Bay, Apr., 1923, 1. James [San Salvador] Island, Dec., 1905 (Williams), 6. *French Guiana*: Cayenne [type of *crenatus*, not examined]. *Paraguay*: 1; Horqueta (Saylor), 1; Alto Parana, Hohenau, 1; Colonia Independencia (Reitter), 3; Encarnacion, 8; Piribebuy, Jan., 1946, 1 ♂; Distrito Misiones, Villa Florida, Nov., 1948, 1 ♂. *Peru*: Trujillo, June, 1939 (Weyrauch), 1; Lima, 9. *Uruguay*: Montevideo, 3; Lazcano, Rocha, Feb., 1921 (Wetmore), 1. *Venezuela*: 1; Ciudad Bolivar, Apr., June, 1898 (Klages), 5, 1940, 1; Caracas Valley, May, June (Reynolds), 6; Paraitepuy, 2; Moitaco, 1; Caracas, 4.

#### *Trox tenebrosus* Harold

*Ecuador*: Riobamba, 2800 m., June, 1905 (Ochs), 1.

## REFERENCES CITED

- ARROW, G.  
 1903. On the laprostick lamellicorn Coleoptera of Grenada and St. Vincent (W. Indies). Trans. Ent. Soc. London, pp. 509-520.  
 1909. On the characters and relationships of the less-known groups of lamellicorn Coleoptera. *Ibid.*, pp. 479-507.  
 1912. Subfamily Troginae. In Junk, W., Coleopterorum catalogus. Berlin, vol. 19, pp. 52-63.
- BÁGUENA, L.  
 1959. Cuatro novedades y un comentario sobre coleópteros de España. Eos, vol. 35, pp. 209-214, figs. 1-4.
- BALTHASAR, V.  
 1936. Monographie der Subfamilie Troginae der palaearktischen Region. In Festschrift zum 60 Geburtstag von . . . Embrik Strand. Riga, vol. 1, pp. 407-459, figs. 1-15.
- BERG, F. G. C.  
 1884. [*Trox globulatus* Fairmaire is synonym of *T. hemisphaericus* Burmeister.] Bull. Séances Ann. Soc. Ent. France, ser. 6, vol. 4, p. xcvi.
- BLACKWELDER, R. E.  
 1944. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 2. Scarabaeidae; Troginae. Bull. U. S. Natl. Mus., no. 185, pp. 218-219.
- BLANCHARD, E.  
 1846. Insectes de l'Amérique recueillis par Alcide d'Orbigny. In d'Orbigny, A., Voyage dans l'Amérique méridionale. Paris, vol. 6, pt. 2, pp. 1-222, pls. 1-52.
- BLATCHLEY, W. S.  
 1910. The Coleoptera of Indiana. Scarabaeidae. Indianapolis, vol. 2, pp. 909-1005, figs. 359-422.
- BORRE, A.  
 1886. Catalogue des trogides décrits jusqu'à ce jour . . . géographique. Ann. Ent. Soc. Belgique, vol. 30, pp. 54-82.
- BURMEISTER, H.  
 1876. Die argentinischen Arten der Gattung *Trox* Fabr. Stettiner Ent. Zeitg., vol. 37, pp. 241-268.
- CANDÈZE, E. C. A.  
 1870-1871. [*Trox* in wool from Argentina.] Compt. Rendus Ann. Soc. Ent. Belgique, vol. 14, p. xxiii.
- CONIL, P. A.  
 1880. Études sur l'*Acridium paranense* Burm., ses variétés et plusieurs insectes qui le détruisent. Periodico Zool. Soc. Zool. Argentina, vol. 3, pp. 177-257.
- CURTIS, J.  
 1845. Descriptions . . . of the insects collected by Captain P. P. King, R.N., F.R.S. and L.S., in the survey of the Straits of Magellan. Trans. Linnean Soc. London, vol. 19, pp. 441-475, pl. 41.
- ERICHSON, W. F.  
 1847. Conspectus insectorum coleopterorum quae in Republica Peruana observata sunt. Arch. Naturgesch., vol. 13, no. 1, pp. 67-185.
- ESCHSCHOLTZ, J. F. VON  
 1882. Entomographien. Berlin, pt. 1, 128 pp.
- FABRICIUS, J. C.  
 1775. Systema entomologiae. Flensburg and Leipzig, pp. 1-832.
- FAIRMAIRE, L.  
 1883. Note sur quelques coléoptères de Magellan et de Santa-Cruz. Ann. Ent. Soc. France, ser. 6, vol. 3, pp. 483-506.
- FELSCH, C.  
 1901. Synonymische Bemerkungen. Deutsche Ent. Zeitschr., pp. 154-155.
- GERMAR, E. F.  
 1824. Insectorum species novae. Halle, vol. 1, pp. 1-624.
- GUÉRIN-MÉNEVILLE, F. E.  
 1844. Iconographie du règne animal de G. Cuvier . . . Insectes. Paris, vol. 3, pp. 5-576, pls. 1-104.
- GUTIÉRREZ ALONSO, R.  
 1950. Scarabaeidae del norte de Chile. An. Soc. Cient. Argentina, vol. 149, pp. 52-75, figs. 1-15.
- HAAF, E.  
 1953. Die afrikanischen Arten der Gattung *Trox* F. Ent. Arb. Mus. Frey, vol. 4, pp. 309-346, figs. 1-28.  
 1954a. Die afrikanischen und orientalischen Arten der Gattung *Trox*. *Ibid.*, vol. 5, pp. 326-393, figs. 1-41, pls. 17-20.  
 1954b. Die australischen Arten der Gattung *Trox*. *Ibid.*, vol. 5, pp. 691-740, figs. 1-3, pls. 32-33.  
 1954c. Eine neue *Trox*-Art aus Süd-Afrika. Durban Mus. Novitates, vol. 4, pp. 97-99, 2 figs.  
 1955. Troginae (Coleoptera, Lamellicornia). In Institut des Parcs Nationaux du Congo Belge, parc National de l'Upemba, I, Mission G. F. de Witte. Brussels, fasc. 38, pt. 3, pp. 45-50, fig. 1.  
 1957a. Drei neue *Trox*-Arten (Col. Scarab.). Ent. Arb. Mus. Frey, vol. 8, pp. 692-695, figs. 1-2.  
 1957b. On new Australian species of *Trox* (Col.). Mem. Natl. Mus. Victoria, no. 21, pp. 117-120, pl. 1.



- 1958a. Coleoptera Trogidae. South African Animal Life, vol. 5, pp. 473-478, figs. 1-2.
- 1958b. Nachtrag zur Revision der australischen Arten der Gattung *Trox* (Col. Scarab.). Ent. Arb. Mus. Frey, vol. 9, pp. 1078-1082.
- HAROLD, E. VON
1868. Diagnosen neuer Coprophagen. Coleopterologische Hefte, vol. 4, pp. 79-86.
1872. Monographie der Gattung *Trox*. *Ibid.*, vol. 9, pp. 1-192.
- HOWDEN, H., AND P. VAURIE
1957. Two new species of *Trox* from Florida (Coleoptera, Scarabaeidae). Amer. Mus. Novitates, no. 1818, pp. 1-6, figs. 1-3.
- LACORDAIRE, T.
1856. Histoire naturelle des insectes. Paris, vol. 3, pp. 148-157.
- LATREILLE, P. A.
1810. Considérations générales . . . des insectes. Paris, pp. 9-444.
- LECONTE, J. L., AND G. H. HORN
1883. Classification of the Coleoptera of North America. Smithsonian Misc. Coll., vol. 26, pt. 4, pp. 1-567.
- LEWIS, G.
1895. On the lamellicorn Coleoptera of Japan, and notices of others. Ann. Mag. Nat. Hist., ser. 6, vol. 16, pp. 374-408, figs. 1-9.
- LINNAEUS, C.
1767. Systema naturae. Editio duodecima, reformata. Stockholm, vol. 1, pp. 533-1327.
- MACLEAY, W. S.
1819. Horae entomologicae. London, vol. 1, pt. 1, pp. 1-524, 3 pls. [*Fide* Arrow, 1912; not seen.]
- MIKSIC, R.
1958. Eine neue *Trox*-Art aus dem Togoland (Coleoptera-Scarabaeidae). Ent. Ber., The Hague, vol. 18, pp. 15-16.
- MUTCHLER, A. J.
1925. Coleoptera from the Williams Galapagos expedition. Zoologica, vol. 5, no. 20, pp. 219-240, figs. 42-46.
- NAKANE, T.
1954. New or little known Coleoptera from Japan and its adjacent regions. Trans. Shikoku Ent. Soc., vol. 4, pp. 7-15, figs. 1-10.
- NOMURA, S.
1937. On the genus *Trox* of Japan (Scarabaeidae) with description of a new species. Nippon no Kochu, vol. 1, pp. 77-86, 1 pl.
- OLIVIER, A. G.
1789. Entomologie. Paris, vol. 1, no. 4, pp. 1-14, pl. 1.
- PAULIAN, R.
1936. Faune entomologique de Madagascar. Bull. Acad. Malgache, new ser., vol. 19, pp. 129-143, pl. 10.
- RITCHER, P. O.
1958. Biology of Scarabaeidae. Ann. Rev. Ent., vol. 3, pp. 311-334.
- ROBINSON, M.
1948. A new genus of Scarabaeidae (Coleoptera). Notulae Nat., no. 211, pp. 1-2, 1 fig.
- SHARP, D.
1897. On the stridulatory organs of *Trox*. Ent. Monthly Mag., vol. 33, pp. 206-207.
- STRAND, A.
1959. Coleoptera i reir av musvak (*Buteo buteo* L.). Coleoptera found in mousehawk nests. Norsk Ent. Tidsskr., vol. 11, pp. 46-49.
- VAN DYKE, E. C.
1953. The Coleoptera of the Galapagos Islands. Occas. Papers California Acad. Sci., no. 22, pp. 1-181, pls. 1-7.
- VAURIE, P.
1955. A revision of the genus *Trox* in North America. Bull. Amer. Mus. Nat. Hist., vol. 106, pp. 1-90, figs. 1-27.

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