

Studies of the Subtribe Tachyina  
(Coleoptera: Carabidae: Bembidiini),  
Part I: A Revision of the  
Neotropical Genus *Xystosomus* Schaum

TERRY L. ERWIN

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## ABSTRACT

Erwin, Terry L. Studies of the Subtribe Tachyina (Coleoptera: Carabidae: Bembidiini), Part I: A Revision of the Neotropical Genus *Xystosomus* Schaum. *Smithsonian Contributions to Zoology*, number 140, 39 pages, 72 figures, 1973.— The neotropical genus *Xystosomus* Schaum is revised. Twenty-two species are described as new; ten of thirteen previously described species are retained as valid, with the other three names being reduced to junior synonyms; and the species originally described as *Xystosomus insularis* is transferred to the genus *Tachymenis*. A key to the species is given for adults and pertinent characteristics are illustrated. All taxa are described or redescribed and partially illustrated. Six infrageneric evolutionary lines are discussed and the characteristic body forms of four lines are illustrated in habitus. Distribution for each species is listed by locality, and a map shows the range of each species group. Evolutionary considerations, natural history, and behavior are discussed where data are available.

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# Studies of the Subtribe Tachyina (Coleoptera: Carabidae: Bembidiini), Part I: A Revision of the Neotropical Genus *Xystosomus* Schaum

*Terry L. Erwin*

## Introduction

This is the first paper to be issued in a long series that will review all groups of the subtribe Tachyina. My ultimate goal is a faunal analysis of the world Tachyina, hence the purpose of each part in the series is to present various data (taxonomy, natural history, behavior, distribution, etc.) for each genus or a generic group (if small numbers of species are included in each genus) in a way that can be used easily in the subsequent overall analysis. The present part deals with a moderate-sized neotropical genus of mostly arboreal or subarboreal Tachyina.

The species of the genus *Xystosomus* have never been collectively reviewed. The literature consists of brief and mainly inconclusive species descriptions by Bates (11 species in five papers, 1871–1884) and Schaum (2 species in two papers, 1860, 1863). Other than in catalogs, I have seen no mention of the genus in the literature since the time that Bates and Schaum wrote, except for Darlington's (1939: 86) *Xystosomus insularis*, which is not a *Xystosomus* but a *Tachymenis* [*Tachymenis insularis* (Darlington), new combination] (Figure 2).

Members of *T. insularis* have converged in body form with members of *Xystosomus* so much that only a comprehensive study of all known species of *Xystosomus* and other primitive Tachyina has unveiled its true nature and its probable role in the evolution of the Tachyina; this will be discussed further in a forthcoming generic reclassification.

The immature stages of *Xystosomus* are unknown, but notes on habits and habitats of the adults were recorded by Bates (1871b) and by Nevermann on his excellent specimen labels. Also, my wife and I made observations of living beetles in the field and laboratory that supplemented observations made previously in Mexico by George Ball and me. This information is given under each pertinent species description and then summarized and analyzed under the section on natural history at the end of the paper.

Until now, the systematic concept of this genus was that of a heterogeneous assemblage of tachyine-like beetles with a great amount of diversity, but there was no clear evidence presented that they were related among themselves or to any other group(s) of the Bembidiini. With the benefit of a background study on all the rest of the world Tachyina, I conclude that the *Xystosomus* species form four general trends of evolutionary develop-

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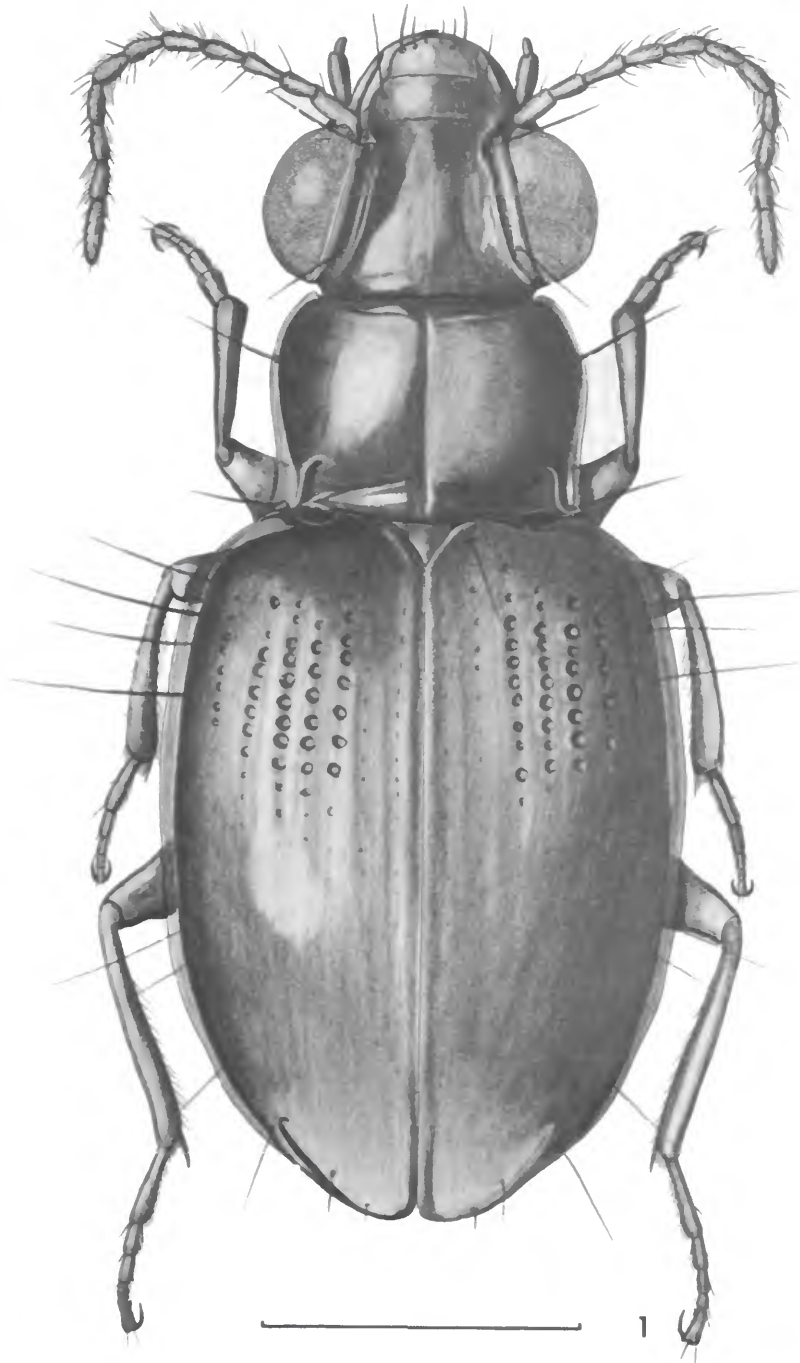


FIGURE 1.—Habitus of *Xystosomus elaphrinus*, male, from Kartabo Point, British Guiana.

ment (the *gruti* group trend, the *elaphrinus* group trend, the *microtretus* group trend, and the *parainsularis-inflatus-laevis* group trend). One of these trends, the latter, has been duplicated in members of at least one associated primitive genus, *Tachymenis* (wingless-globose body form). I have treated this latter complex as three species groups because I think they are morphologically convergent, all arising from different parts of the *gruti* group. I also conclude that the overall classification of *Xystosomus* and of some other genera of Tachyina is best handled in species groups rather than by erecting countless subgenera to reflect these evolutionary trends and other trends in the Tachyina. Lastly, I conclude that *Xystosomus* members form a link between *Bembidion* and its allies (*Bembidiina*) and Tachyina but that they are true Tachyina by virtue of numbers and kinds of apomorphic trends. The evidence for the above is presented below along with descriptions of new taxa and redescriptions of previously described taxa.

Phylogeny and zoogeography of *Xystosomus* species are discussed in only a general way here, but they will be elaborated upon in another part of the Tachyina study where all generic components can be discussed together.

ACKNOWLEDGMENTS.—I heartily thank the following persons for making this study possible: La Verne Erwin, my wife, for field work, measuring of specimens, and critically reading the manuscript; Prof. P. J. Darlington, Jr., for providing museum space, equipment, and discussion during a research fellowship at the Museum of Comparative Zoology (MCZ), and for the loan of specimens; Prof. C. H. Lindroth for providing working space, equipment, and discussion during a year's visit to Lund University in Sweden; Mme. A. Bons, Muséum National d'Histoire Naturelle, Paris (MHNP), Prof. George E. Ball, University of Alberta, Edmonton, Canada (UASM), Mr. Peter Hammond, British Museum (Natural History), London (BMNH), Mr. Hugh B. Leech, California Academy of Sciences (CAS), Dr. F. Hieke, Zoological Museum of Humboldt University, Berlin (HUB), and Mr. J. Nègre, Versailles, France (JNeg), all for the loan of specimens in their charge or collection; to Mr. M. Druckenbrod for the line drawings of the pronota and maps; and to Mr. W. Brown of the Smithsonian's

scanning electron microscope laboratory for the carefully made micrographs.

This study was supported in part by the American Philosophical Society (Penrose Fund #5795) through funds provided for type studies at the British Museum (Natural History) and the Muséum National d'Histoire Naturelle, Paris, and in part by the environmental sciences program of the Smithsonian Institution through funds provided for field work, equipment, and support personnel.

METHODS.—This study is the result of the examination of more than 300 specimens of *Xystosomus* species and thousands of specimens of other Tachyina. Unfortunately, members of *Xystosomus* species are difficult to collect, and even though many major Neotropical collections were examined, very few (compared with other Tachyina groups) individuals were found. Hopefully, the informa-

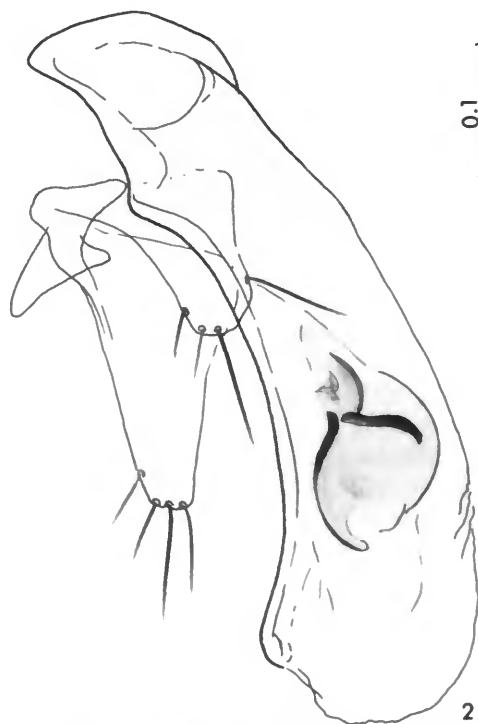


FIGURE 2.—Male genitalia, left lateral aspect of *Tachymenis insularis* (Darlington) from Loma Vieja, Dominican Republic.

tion here will stimulate collectors and natural historians to look in the proper habitats for these interesting beetles.

Methods of dissection, illustrations, and procedure (except as noted below) are the same as those used by me in the past (Erwin 1970, 1972). The short line accompanying the illustrations equals 1.0 mm unless otherwise noted. In the 1970 paper, I outlined my criteria for recognizing species, subspecies, and supraspecific taxa and they need not be repeated here.

I changed some parts of the format of species descriptions here to make them shorter and easier to use. For example, all data concerning aspects of natural history are given under that single heading rather than dividing them into separate statements, and a summary of all natural history data is given near the end of the paper. Also, variation is discussed separately from the description only where sufficient material was available from enough localities. I have seen all type-specimens mentioned. Finally, the species are numbered for easier reference between key, checklist, and descriptions.

Measurements used here are the width/length ratio (W/L) of the pronotum, total width, and total length. The width measurement of the pronotum is taken at the widest point and the length is taken along the midline, both of which are made with the pronotal plane level. W/L is given as  $\bar{x}$  (mean ratio value for all specimens measured), together with the total range of ratio variation. Total length and width measurements are given only as a range of upper and lower limits on specimens seen. The length measurement is made as one measurement from the apex of the elytra to the anterior edge of the labrum unless the specimen is so bent that these points are out of focus, in which case the head, pronotum, and elytra are measured separately (Erwin 1970). The width is measured across the widest part of the elytra unless these are separated, and in this case each elytron is measured separately and the two resultant figures are added together.

The code for elytral chaetotaxy was published previously (Erwin 1972) and need not be duplicated here. The code is based on a study of all groups of known Tachyina, but it has an "open-ended" numbering system in case new setal posi-

tions are discovered in poorly represented groups (e.g., Australian Region groups).

The abbreviations given in the acknowledgments indicate the museums or personal collections from which studied specimens were borrowed. The abbreviation used for the National Museum of Natural History (formerly United States National Museum) is USNM. Locality records are listed in the following order: Country, state and/or province, exact locality, and abbreviation of depository.

### Checklist of *Xystosomus* species

#### The *gruti* group

1. *X. gruti* Bates (1871a:248)
2. *X. ampliatus* Bates (1884:290)
3. *X. nigripalpis*, new species
4. *X. strigosus* Bates (1871a:248)
5. *X. iris*, new species
6. *X. sculpticollis* Bates (1871b:266)
7. *X. negrei*, new species
8. *X. aetholius*, new species
9. *X. anterocostis*, new species
10. *X. sublaevis* Bates (1882:146)
11. *X. sulcicostis* Bates (1882:146)
12. *X. apicisulcatus*, new species
13. *X. batesi*, new species
14. *X. seriatus*, new species
15. *X. ovatulus* Bates (1871a:247)
16. *X. grossipunctatus*, new species

#### The *elaphrinus* group

17. *X. elaphrinus* Bates (1871b:267)
18. *X. notiophiloides*, new species
19. *X. spangleri*, new species

#### The *microtretus* group

20. *X. microtretus*, new species
21. *X. polytretus*, new species

#### The *parainsularis* group

22. *X. parainsularis*, new species
23. *X. bisulcifrons*, new species

#### The *inflatus* group

24. *X. inflatus* (Schaum) (1859:202)
25. *X. convexus*, new species

#### The *laevis* group

26. *X. laevis*, new species
27. *X. paralaevis*, new species
28. *X. laevimicans*, new species
29. *X. impressifrons*, new species
30. *X. niger*, new species
31. *X. tholus*, new species
32. *X. turgidus* (Schaum) (1863:89)

### Genus *Xystosomus* Schaum

*Xystosomus* Schaum, 1863:89.

TYPE-SPECIES.—*Tachys inflatus* Schaum (1859:



202), here designated, as Schaum did not designate either of his two species as the type (nor has any subsequent author); however, this is the first-mentioned species in Schaum's discussion.

**DESCRIPTION.**—*Form* (Figures 1, 3, 43, 56): Broad and convex. Easily recognized from other Tachyina by the truncate anterior tibiae and absence of discal elytral setigerous pores.

*Color:* Body rufous to black, members of many species with metallic green luster or iridescence of pronotum and elytra; appendages usually testaceous or slightly infuscated, piceous in members of some species.

*Head:* Mentum with acute tooth on anterior margin, nonfoveate; antennae with pubescence on apical half of article 4 and on all of articles 5–11.

*Prothorax:* Prosternum sparsely setigerous; coxal cavities biporolate-separate-closed; tibia with truncate apex; claws simple with small basal tooth on medial edge.

*Mesothorax:* Elytra with marginal explanation nonsetulose and nonserrate, recurrent groove moderately long and not quite parallel to side margin

but closer to it than to suture, anterior apex of recurrent groove variously curved medially or not, elytral striae present or not (when present, punctulate or not or appearing as rows of serial punctures), intervals convex or flat, plica present, discal setigerous pores absent; coxae conjunct-confluent.

*Abdomen:* Last visible sternum of female with four setigerous pores in parallel row with posterior edge of that sternum; male with two setigerous pores.

*Secondary sexual characteristics:* Male with basal two anterior tarsal articles slightly dilated or broadly dilated and asymmetric, with modified setae beneath; male with two slender parameres, each with three to five setae, internal sac and apex of median lobe various; female with stylus of ovipositor bladelike with two stout spines laterally, one spine medially.

*Size:* Length, 1.9–5.5 mm; width, 1.0–2.4 mm.

**DISTRIBUTION** (Figures 69–72).—The combined ranges of the known species of this genus extend from Vera Cruz, Mexico, south to Santa Catarina, Brazil.

### Key to Species Groups and Species

1. Metepisternum square or nearly so; metasternum extremely short, posterior and middle coxae almost contiguous; flight wings absent ..... 2  
Metepisternum rectangular, its lateral margin longer than anterior margin; metasternum more normal, that is, its length from posterior coxa to middle coxa subequal to or longer than diameter of middle coxa, thus posterior and middle coxae widely separated; flight wings present .....12
2. (1) Frons foveate, one fovea each side of midline; elytra not punctulate .....  
..... (*parainsularis* group) 3  
Frons not foveate, although frontal furrows may be sulcate posteriorly; elytra punctulate or not ..... 4
3. (2) Elytron with seven plainly traceable, partially striate rows of serial punctulae; frontal furrows sulcate posteriorly ..... 23. *X. bisulcifrons*, new species  
Elytron smooth (striae 2 and 3 faintly visible in some specimens); frontal furrows moderately impressed throughout ..... 22. *X. parainsularis*, new species
4. (2) Pronotum with well-defined posterolateral carinae ..... (*inflatus* group) 5  
Pronotum without well-defined posterolateral carinae ..... (*laevis* group) 6
5. (4) Pronotum with strongly developed posterolateral carinae and with a deep triangular fovea medial to each carina ..... 24. *X. inflatus* (Schaum)  
Pronotum with feebly developed posterolateral carinae and without foveae medial to each carinae ..... 25. *X. convexus*, new species
6. (4) Pronotum (Figure 57) with hind angles denticulate, side margins abruptly but shallowly sinuate anterior to angle; microsculpture absent from pronotum and elytra .....  
..... 26. *X. laevis*, new species  
Pronotum with sharp or obtuse hind angles, not denticulate, sides straight or arcuate; microsculpture of closely spaced, finely impressed transverse lines ..... 7
7. (6) Pronotum without lateral setigerous pores ..... 8  
Pronotum with at least one pair of pores .....11

8. (7) Pronotum (Figure 59) constricted towards base, side margins very slightly sinuate near hind angles ..... 28. *X. laevimicans*, new species  
 Pronotum with lateral margins evenly arcuate from base to apex ..... 9
9. (8) Pronotum (Figure 58) with hind angles sharp, about 90°; integument bright rufous, at least dorsally; smaller beetles, length 1.9–2.2 mm ... 27. *X. paralaevis*, new species  
 Pronotum with obtusely rounded hind angles; integument black or piceous; larger beetles, length 2.4–2.7 mm ..... 10
10. (9) Frons with swollen tubercle laterally at anterior margin of eye, frontal furrows deflected laterally almost at right angles posterior to tubercle; integument black ..... 30. *X. niger*, new species  
 Frons without tubercle, frontal furrows parallel and straight throughout their length; integument piceous ..... 31. *X. tholus*, new species
11. (7) Pronotum (Figure 62) with anterior pair of lateral setigerous pores, posterior pair absent ..... 32. *X. turgidus* (Schaum)  
 Pronotum (Figure 56) with both pairs of lateral setigerous pores ..... 29. *X. impressifrons*, new species
12. (1) Pronotum narrow, much narrower than head across eyes; eyes huge and hemispherical ..... (*elaphrinus* group) 13  
 Pronotum wider than head across eyes; eyes small or large ..... 15
13. (12) Elytral striae (Figure 1) with basal third coarsely and unevenly punctate, apical two-thirds much less impressed or absent ..... 17. *X. elaphrinus* Bates  
 Elytral striae shallowly and more or less evenly impressed throughout or elytron with partially striate rows of punctulae throughout ..... 14
14. (13) Elytral striae entire although finer at apex, 1–8 present, 7 and 8 especially deep basally ..... 18. *X. notiophiloides*, new species  
 Elytron with six partially striate rows of fine punctulae .... 19. *X. spangleri*, new species
15. (12) Pronotum with lateral margins explanate, at least in basal half, and laterobasal carinae strongly developed ..... (*gruti* group) 16  
 Pronotum without explanate lateral margins; carinae feebly developed ..... (*microtretus* group) 31
16. (15) Pronotum (Figure 11) with six longitudinal ridges on disc separated from each other by deep sulci ..... 6. *X. sculpticollis* Bates  
 Pronotum without ridges on disc ..... 17
17. (16) Lateral elytral striae deeper and more coarsely punctate than discal striae; lateral intervals more convex than discal ones ..... 18  
 Lateral striae and intervals (if present) about the same as those on disc ..... 23
18. (17) Discal striae well impressed, intervals more or less convex ..... 19  
 Discal striae virtually absent (slight trace barely visible on some specimens) ..... 21
19. (18) Recurrent groove on elytral apex doubled back to apex of stria 2 ... 5. *X. iris*, new species  
 Recurrent groove not or only slightly doubled back ..... 20
20. (19) Larger beetles, 3.7–5.2 mm, with metallic green luster of dorsal surface and with testaceous or slightly infuscated palpi ..... 1. *X. gruti* Bates  
 Smaller beetles, 3.3–3.9 mm, with moderately iridescent, almost black dorsal surface and piceous palpi ..... 3. *X. nigripalpis*, new species
21. (18) Elytron laterally with four or five convex intervals distinct to at least apical third, discally with at least traces of striae. (Pronotum, Figure 16) .... 11. *X. sulcicostis* Bates  
 Elytron laterally with three or four barely convex intervals distinct to about middle of elytron, disc with rows of faintly impressed punctulae ..... 22
22. (21) Pronotum (Figure 14) with side margins sinuate in basal third ..... 9. *X. anterocostis*, new species  
 Pronotum (Figure 15) with side margins straight or slightly arcuate in basal third .... 10. *X. sublaevis* Bates
23. (17) Elytron without striae or with striae only on disc ..... 24  
 Elytron with well-impressed striae or serial punctures throughout its length ..... 26
24. (23) Pronotum (Figure 12) with posterolateral carinae extended anteriorly for one-half the length of pronotum; integument black ..... 7. *X. negrei*, new species  
 Pronotum with posterolateral carinae extended anteriorly for only one-third the length of pronotum; integument reddish ..... 25

25. (23) Elytron with apex of sutural striae deepened, sulcate ..... 12. *X. apicisulcatus*, new species  
 Elytron without sutural striae ..... 8. *X. aetholius*, new species
26. (23) Elytral striae continuous and deeply impressed between serial punctures ..... 27  
 Elytron without strial impressions between serial punctures ..... 28
27. (26) Pronotum (Figure 7) with lateral explanation entire and very wide to anterior angles ..... 2. *X. ampliatus* Bates  
 Pronotum (Figure 9) with lateral explanation narrow and confined to basal half ..... 4. *X. strigosus* Bates
28. (27) Microsculpture absent; pronotum and elytra smooth, shiny ..... 29  
 Microsculpture present, of either finely or coarsely engraved transverse lines, surface dull ..... 30
29. (28) Side margins of pronotum (Figure 18) broadly explanate from base to apex, less so toward apex; frontal furrows short and deep, reaching posteriorly to mideye level ..... 13. *X. batesi*, new species  
 Side margin of pronotum (Figure 19) slightly explanate at base only; frontal furrows extended posteriorly beyond mideye level ..... 14. *X. seriatus*, new species
30. (28) Elytral surface matte-like due to coarsely engraved transverse microsculpture (Figure 22g) ..... 15. *X. ovatulus* Bates  
 Elytral surface more shiny due to finely impressed transverse microsculpture ..... 16. *X. grossipunctatus*, new species
31. (15) Pronotum (Figure 43) widest at middle ..... 20. *X. microtretus*, new species  
 Pronotum (Figure 44) trapezoidal, widest at base ..... 21. *X. polytretus*, new species

### The *gruti* group

The members of the *gruti* group are characterized by similarities of the male genitalia, especially by the presence of a "brush sclerite" on the internal sac of the median lobe. The same kind of sclerite is also found well developed in all members of the genera *Bembidion* (except where secondarily reduced, for example in the *vile* group) and *Asaphidion*. Externally, the members of the *gruti* group are characterized by the following combination of characteristics: large eyes; large and strongly developed carinae posterolaterally on the pronotum; transverse pronotum wider than head across eyes; broadly explanate sides of the pronotum and elytra; presence of two pairs of lateral setigerous pores on the pronotum (except *Xystosomus negrei*); sulcate prosternal process; fully developed flight wings; and relatively large body size (some of the largest members of Tachyina).

Besides the combination above, many species of this group have members with iridescent or metallic green dorsal surfaces (the only Tachyina with metallic coloration) and deeply engraved, punctate elytral striae.

Presently representing this group are 16 species with a combined range (Figure 69) extending from southern Mexico to southern Brazil.

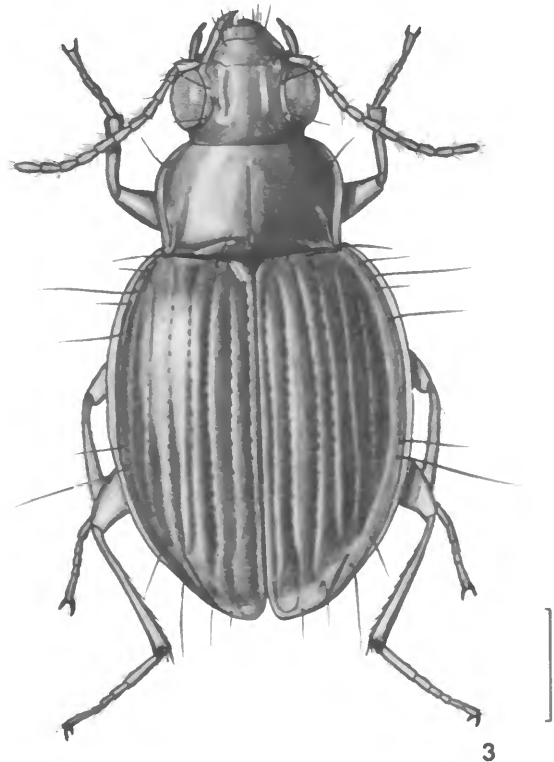


FIGURE 3.—Habitus of *Xystosomus gruti*, female, from Rio Piracicaba, Brazil.

### 1. *Xystosomus gruti* Bates

FIGURES 3, 22a-c, 23 24, 36, 69

*Xystosomus gruti* Bates, 1871a:248. [Lectotype, female, in MHNP, here selected. Type-locality: Rio de Janeiro, Brazil.]

*Xystosomus hilaris* Bates, 1871b:266. [Holotype, male, in MHNP (a specimen mentioned by Bates). Type-locality: Ega (Teffé), Brazil. New synonymy.]

*Xystosomus belti* Bates, 1878:601. [Lectotype, male, in MHNP, here selected. Type-locality: Chontales, Nicaragua. New synonymy.]

*Xystosomus olivaceus* Bates, 1878:601. [Holotype, female, in MHNP, a specimen mentioned by Bates, 1882:147, where he recognized his species as a color aberration of *X. belti* Bates. Type-locality: Chontales, Nicaragua.]

**DESCRIPTION.**—*Form* (Figure 3): Large, broad, moderately convex (much less so than members of *laevis* group) with large head, narrow pronotum (compared with members of *laevis* group), and fully striate elytra. A variable species (see below) and easily distinguished from the similar *X. ampliatus* by the deeper lateral striae and the green metallic luster of the entire dorsal surface of the pronotum and elytra.

*Color*: Head and venter rufopiceous; pronotum and elytra dorsally with metallic green luster; appendages testaceous or partly infuscated.

*Head*: Broad between eyes; frontal furrows moderately impressed; eyes very large and prominent.

*Pronotum* (Figure 3): Transverse (W/L,  $\bar{x}$  1.60; range, 1.41–1.85; 69 specimens); lateral setigerous pores present just anterior to middle and at hind angles; laterobasal carina well developed; hind angles about 90° and sharp; side margins broadly explanate and more or less straight to apical third.

*Elytra*: Striae 1–8 of each elytron well impressed and punctulate, sutural stria and lateral four striae more deeply impressed and more coarsely punctulate than striae 2–4; side margins broadly explanate; humeral projection well developed, blunt; chaetotaxy formula Eo–1a, 2b, 3b, 4c, 5a, 6a, 7, 8a, and Ed–1, 7b, 8; plica well developed externally.

*Microsculpture*: Frons (Figure 22a) with well-impressed, nearly isodiametric reticulation; pronotum (Figure 22b) and elytra (Figure 22c) with fine transverse lines which fork but do not form meshes.

*Secondary sexual characters*: Male genitalia characteristic of the species group (Figure 23). Female genitalia characteristic of the species group (Figure 36).

*Size*: Sixty-nine specimens: length, 3.7–5.2 mm; width, 1.9–2.5 mm.

**VARIATION.**—The depth of the elytral striae varies from deep to shallow. Northern South America (Peru) is a center for specimens with deep striae. To the north of this center, shallow or deep striae are found on Central American specimens, but only shallow striae are found on the Mexican specimens. To the south, either shallow or deep striae are found on the Brazilian specimens. Many more samples are needed to accurately assess this characteristic, but from preliminary data it appears that depth of striae is bimodal with shallower striae in the more temperate climates of the species' range.

Slight variation occurs in the shape of the apex of the male median lobe of the genitalia (Figures 23, 24). This variation appears within population samples, however, and is not correlated with geographical area.

The great difference in size (see above) is also independent of geographical area. Both large and small individuals were collected in Costa Rica and Panama. All specimens from Brazil are large, but this may be sample bias, as there are only nine specimens.

**NATURAL HISTORY.**—In August, in Mexico, George Ball and I collected a male specimen that we saw running on the sun-lit bark of a fallen and partially burnt "buttress tree" after we disturbed some bracket fungi. On Barro Colorado Island, in December, my wife and I collected a female specimen in a pile of deep loose leaves under the crown of a recently fallen tree. The latter beetle was in the company of *X. nigripalpis* (see below for details). F. Nevermann's excellent collecting records pinned with each specimen give the following data (translated from German): "on leaf pile in sawmill, June," 2 specimens; "on leaves of *Cedrela mexicana*, May" (Meliaceae), 4 specimens; "on wilted foliage of *Quararibae turbinata*, October" (Bombacaceae), 10 specimens; "on dry wood of *Pentaclethra filamentosa*, March" (Leguminosae), 1 specimen; "on dry wood of *Virola warburgii*, February" (Myristicaceae), 2 specimens; "under loose bark, November and June," 4 specimens; "wilted leaf of *Acanthorhiza* sp., June" (Phoenicaceae), 1 specimen; "at fermenting plant juice on freshly cut wood, August," 5 specimens; "at light, July," 1 specimen. I have observed a

captive female from Barro Colorado Island in flight.

Further records indicate specimens were collected in September in Brazil, but no teneral specimens were seen to indicate at what season immatures might be discovered.

The altitudinal range of *X. gruti* is from near sea level on Barro Colorado Island to about 4,000 feet (1,219 m) on Volcán de Chiriquí, with most intermediate elevations represented on specimen labels.

In summary, this is a widespread and variable species occurring at low and medium elevations. In habits, it is probably arboreal, or at least sub-arboreal, and is capable of flight. Adults were collected in every month except January and April. It is probable that adults and immatures overlap.

**BEHAVIOR.**—The specimen from Barro Colorado Island was collected alive and was returned to Washington for further study (it is still alive at this writing). With only one individual, intraspecific reactions are not possible, but when this specimen and *X. nigripalpis* specimens are placed together in the same petri dish both demonstrate fierce aggressiveness. This reaction also occurs between members of *X. nigripalpis* and happens when two beetles come within "setal range" of each other (the elytral "Eo" setae on these beetles are very long). The result of contact is several quick lunges with the mandibles directed toward the other beetle. Many of my living specimens of *X. nigripalpis* are missing the apical articles of the antennae.

**DISTRIBUTION** (Figure 69).—The range of this species extends from Vera Cruz, Mexico, to Rio de Janeiro, Brazil. Throughout the range these beetles are distributed both at lower and middle elevations and in lowland tropical forests and cloud forests.

**LOCALITY RECORDS** (Figure 69).—I have seen at least 74 specimens (old cotypes in BMNH and MHNP not counted) from the following localities:

**MEXICO:** VERACRUZ: 2.5 miles west of Sontecomapan (UASM); Córdoba (MHNP).

**CENTRAL AMERICA:** BRITISH HONDURAS: Toledo District (MCZ). **COSTA RICA:** Hamburg Farm at Reventazón (USNM); Iberia Farm in Santa Clara Province (USNM); Las Mercedes (USNM). **NICARAGUA:** Chontales (MHNP). **PANAMA:** Barro Colorado Island in Canal Zone (USNM); Bugaba (BMNH, MHNP); Cabima (USNM); Volcán de Chiriquí (BMNH, MHNP).

**SOUTH AMERICA:** BRAZIL: Amazonas Province: Teffé

(MHNP); Itaituba (MHNP). **Pará Province:** Pará (MHNP). **Rio de Janeiro Province:** Lagoa de Saquarema (MHNP); "Rio Janeiro" (MHNP); Rio Parahyba (MHNP). **Santa Catarina Province:** Hansa (MHNP). **FRENCH GUIANA:** Gourdonville (MHNP). **PERU:** Monson Valley at Tingo María (CAS).

## 2. *Xystosomus ampliatus* Bates

FIGURES 7, 69

*Xystosomus ampliatus* Bates, 1884:290. [Lectotype, female, BMNH, here selected. Type-locality: Bugaba, Panama.]

**DESCRIPTION.**—*Form:* As in *X. gruti*, but larger. Easily distinguished from *X. gruti* by the overall rufous color, less impressed lateral striae, and the broadly explanate sides of pronotum and elytra.

*Color:* Body rufous; pronotum and elytra dorsally with slight iridescence; appendages testaceous.

*Head:* As in *X. gruti* except frontal furrows less impressed, closer to eye margin; eyes very large and prominent.

*Pronotum* (Figure 7): As in *X. gruti* except explanations broader (W/L,  $\bar{x}$  1.63; range, 1.56–1.68; 3 specimens).

*Elytra:* As in *X. gruti* except lateral striae less impressed than discal ones and explanations broader.

*Microsculpture:* As in *X. gruti*.

*Secondary sexual characters:* Male unknown. Female genitalia characteristic of the species group.

*Size:* Three specimens: length, 4.8–5.5 mm; width, 2.2–2.4 mm.

**NATURAL HISTORY.**—Adults were collected in August and January. No teneral specimens were seen. Nevermann recorded a specimen in "fermenting plant juice on fresh cut wood, August" and a specimen "at night on dry wood of Sapotacca [Sapotaceae], January."

**LOCALITY RECORDS** (Figure 69).—I have seen four specimens from the following localities:

**CENTRAL AMERICA:** COSTA RICA: Hamburg Farm at Reventazón (USNM). **PANAMA:** "Panama" (MHNP); Bugaba (BMNH).

## 3. *Xystosomus nigripalpis*, new species

FIGURES 8, 25, 69

**TYPE-LOCALITY.**—Barro Colorado Island, Canal Zone, Panama.

**TYPE-SPECIMENS.**—The holotype male and allotype are in USNM. These and the paratypes were collected by my wife and me in 1971. Paratypes (21): CAS, 2; BMNH, 2; MCZ, 2; MHNP, 2; UASM, 2; USNM, 11.

**DESCRIPTION.**—*Form*: As in *X. gruti* except elytra slightly more convex. Easily distinguished by the piceous palpi, the nearly black integument of the dorsal surface, and the highly convex lateral intervals of the elytra.

*Color*: Head and body nigropiceous; pronotum and elytra strongly iridescent; appendages partially infuscated; antennae and tarsi testaceous; palpi except apical article almost black.

*Head*: Frontal furrows moderately impressed; eyes large and prominent.

*Pronotum* (Figure 8): Transverse (W/L,  $\bar{x}$  1.56; range, 1.47–1.65; 10 specimens); hind angles slightly obtuse, sides anterior to angles straight; side margins narrowly explanate basally, beaded anteriorly.

*Elytra*: Striae 1–8 of each elytron well impressed and punctulate to apical third, shallowly impressed and nonpunctulate in area of recurrent groove, lateral four striae more deeply impressed and more coarsely punctulate than discal striae, especially near base; lateral intervals convex to at least middle, flattened gradually to apical third, discal intervals less convex, at least in apical two-thirds; side margins broadly explanate; humeral projection moderately developed, well rounded; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia characteristic of the group (Figure 25). Female genitalia characteristic of the species group.

*Size*: Ten specimens: length, 3.3–3.9 mm; width, 1.5–1.8 mm.

**NATURAL HISTORY.**—The type series was collected in and on deep litter at the crown of a fallen tree in the humid, tropical, semideciduous forest of Barro Colorado Island, Panama. The individuals were very active in sunlight (sparse as it was in this part of the forest) and shade, commonly running over undisturbed leaves and twigs. Most specimens were found in the deep leaf litter where the leaves were wilted but not decomposed. Our method of raking and reraking the leaves knocked most specimens to the soil, but close observation showed the beetles to be among the leaves off the

soil. No specimens were teneral. All of these beetles were collected alive and taken to Washington for behavior studies and breeding purposes, the results of which will be published separately. (See also *X. gruti*, under Behavior.) I have observed captive specimens in flight.

**LOCALITY RECORDS** (Figure 69).—I have seen 23 specimens from the following locality:

CENTRAL AMERICA: PANAMA: Canal Zone, Barro Colorado Island.

#### 4. *Xystosomus strigosus* Bates

FIGURES 4–6, 9, 26, 29

*Xystosomus strigosus* Bates, 1871a:248. [Lectotype, female, MHNP, here selected. Type-locality: Rio de Janeiro, Brazil.]

**DESCRIPTION.**—*Form*: Generally as in *X. gruti* except narrower, with more highly convex elytra, and with much smaller eyes. Color as in *X. ampliatus* but easily distinguished from that species by the narrower explanations of the pronotum and elytra.

*Color*: Head and body rufous; pronotum and elytra moderately iridescent; appendages testaceous.

*Head*: Narrow between eyes; frontal furrows deeply and broadly impressed; eyes moderately large and prominent; mouthparts as in Figures 4, 5.

*Pronotum* (Figure 9): Less transverse than in *X. gruti* (W/L,  $\bar{x}$  1.51; range, 1.42–1.64; 5 specimens) and with less explanate side margins, otherwise similar; anterior leg as in Figure 6.

*Elytra*: As in *X. gruti* except all striae evenly impressed and explanations narrower.

*Microsculpture*: As in *X. gruti*.

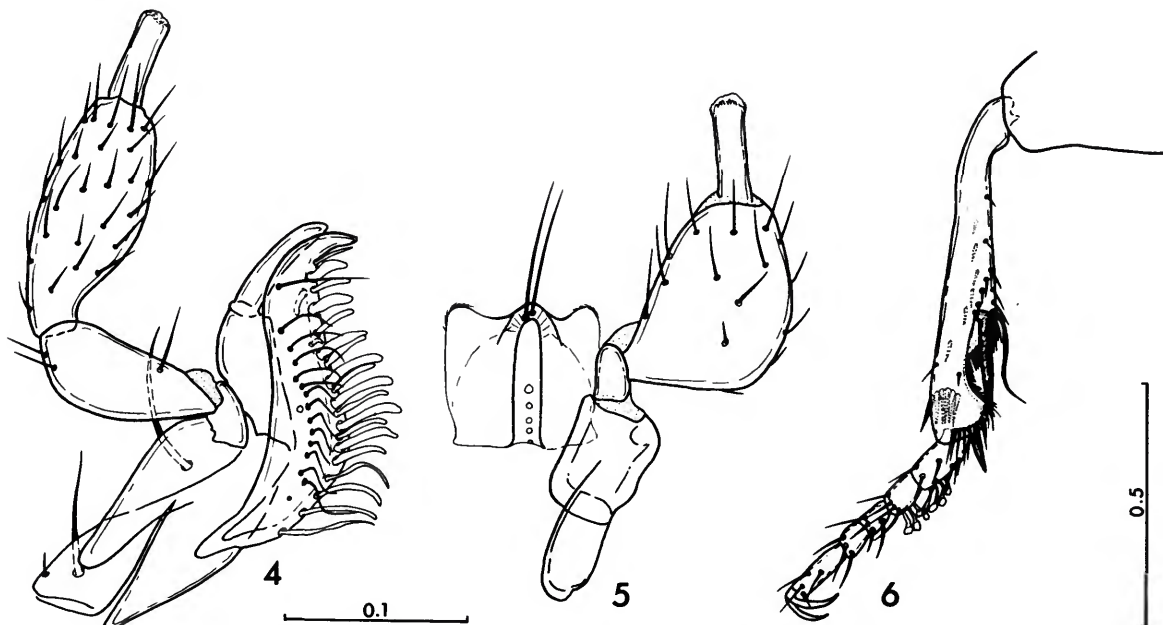
*Secondary sexual characters*: Male genitalia (Figure 26) and female genitalia characteristic of the species group.

*Size*: Five specimens: length, 3.5–3.9 mm; width, 1.6–1.8 mm.

**NATURAL HISTORY.**—Unknown, except adults collected in August and September. No teneral specimens seen.

**LOCALITY RECORDS** (Figure 69).—I have seen six specimens from the following localities:

SOUTH AMERICA: BRAZIL: Rio de Janeiro Province: "Rio Janeiro" (BMNH); Rio Parahyba (MHNP). Santa Clara Province: Nova Teutonia (MCZ, USNM).



FIGURES 4-6.—*Xystosomus strigosus* Bates, male, from Nova Teutonia, Brazil: 4, maxilla, left side, dorsal aspect; 5, labium, right side, ventral aspect; 6, anterior left leg, posterior aspect.

### 5. *Xystosomus iris*, new species

FIGURES 10, 27, 69

**TYPE-LOCALITY.**—Monson Valley, Tingo María, Peru.

**TYPE-SPECIMENS.**—The holotype male and allotype are in CAS. Both were collected by Schlinger and Ross in 1954. Four paratypes from Bolivia: MHNP, 2; USNM, 2.

**DESCRIPTION.**—*Form:* As in *X. strigosus*, except pronotum much narrower. Narrowest species in the group in relation to head width. Easily distinguished from all species of the group by the doubled back recurrent groove which forms a large loop.

**Color:** Head and body rufopiceous; pronotum and elytra with slight metallic green luster; elytra also strongly iridescent; appendages testaceous; antennae slightly infuscated apically.

**Head:** Narrow between eyes; frontal furrows moderately impressed; eyes large and prominent.

**Pronotum** (Figure 10): Quadrate (W/L,  $\bar{x}$  1.46; range, 1.44–1.57; 6 specimens), only slightly wider than head across eyes; hind angles about 90°, side

margins anterior to angles slightly sinuate; side margins narrowly explanate basally, beaded anteriorly.

**Elytra:** Striae 1–8 of each elytron well impressed and punctulate; punctures moderately large and separated by about twice their own diameter; recurrent groove doubled back into a deeply impressed elliptical loop; humeral projection well developed, sharply acute (oblique view); chaetotaxy as in *X. gruti*; plica short, evident externally.

**Microsculpture:** As in *X. gruti*.

**Secondary sexual characters:** Male genitalia (Figure 27) and female genitalia characteristic of the species group.

**Size:** Six specimens: length, 3.0–3.6 mm; width, 1.4–1.7 mm.

**NATURAL HISTORY.**—Unknown, except adults collected in March (Bolivia) and October (Peru). No general specimens seen.

**LOCALITY RECORDS** (Figure 69).—I have seen six specimens from the following localities:

**SOUTH AMERICA: BOLIVIA:** Cochabamba (MHNP); Ca-chuela Esperanza (USNM). **PERU:** Monson Valley, Tingo María (CAS).

### 6. *Xystosomus sculpticollis* Bates

FIGURES 11, 28, 69

*Xystosomus sculpticollis* Bates, 1871b:266. [Lectotype, male, MHNP, here selected. Type-locality: Ega (Teffé), Brazil.]

**DESCRIPTION.**—*Form*: As in *X. strigosus*, but easily distinguished from that species and all other species of the group by the longitudinal carinae of the pronotal disc.

*Color*: Head and body rufopiceous, elytra slightly iridescent, appendages testaceous.

*Head*: Narrow between eyes; frontal furrows moderately impressed with sharp carinae lateral to them near eye margin; eyes large and prominent.

*Pronotum* (Figure 11): Quadrate (W/L,  $\bar{x}$  1.46; range, 1.39–1.58; 3 specimens), only slightly wider than head across eyes; disc with six longitudinal carinae, each separated from the other by deep sulci; hind angles about 90°, sides anterior to angles straight to about middle; side margins broadly explanate in basal half, narrowly explanate in apical half.

*Elytra*: Striae 1–8 of each elytron well impressed and punctate, entire though less impressed at apex; punctures large and well impressed, more so laterally, each contiguous with the next by a shallowly impressed stria, at least in basal half; recurrent groove doubled back into a hook, deeply impressed; chaetotaxy as in *X. gruti*; plica well developed externally, short.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia characteristic of the species group (Figure 28). Female genitalia characteristic of the species group.

*Size*: Three specimens: length, 3.3–3.6 mm; width, 1.6–1.8 mm.

**NATURAL HISTORY.**—Unknown, except that the specimen from Teffé was collected in the "1st quarter of 1879." No teneral specimens seen.

**LOCALITY RECORDS** (Figure 69).—I have seen four specimens from the following localities:

**SOUTH AMERICA: BRAZIL:** Amazonas Province: São Paulo d'Oliveira (MHNP); Teffé (Ega) (MHNP).

### 7. *Xystosomus negrei*, new species

FIGURES 12, 29, 69

**TYPE-LOCALITY.**—Rancho Grande, Maracay, Venezuela.

**TYPE-SPECIMENS.**—The holotype male is in MHNP. Two male paratypes: JNeg, 1; USNM, 1.

**DESCRIPTION.**—*Form*: As in *X. strigosus*, but easily distinguished from that species and all others in the group by the long carinae of the pronotum.

*Color*: Head and body dark piceous, almost black; pronotum and elytra shiny and slightly iridescent; appendages testaceous or slightly infuscated.

*Head*: Broad between eyes; frontal furrows short and deeply impressed; eyes medium-sized and slightly prominent.

*Pronotum* (Figure 12): Transverse (W/L,  $\bar{x}$  1.56; range, 1.45–1.58; 3 specimens); lateral setigerous pores at hind angles only (see Remarks); latero-basal carina well developed, extended to apical half of pronotum; hind angles about 90°; side margins explanate throughout, more so in basal half, and straight or slightly incurved at basal third.

*Elytra*: Striae 1–4 slightly impressed, at least in basal half, 5–8 effaced, those present unevenly punctulate; side margins explanate; humeral projection well developed, obtuse; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia (Figure 29) characteristic of the species group. Female unknown.

*Size*: Three specimens: length, 3.4–3.7 mm; width, 1.6–1.7 mm.

**NATURAL HISTORY.**—Unknown.

**LOCALITY RECORDS** (Figure 69).—I have seen three specimens from the following locality:

**SOUTH AMERICA: VENEZUELA:** Rancho Grande, Maracay (MHNP, JNeg, USNM).

**REMARKS.**—Although the three known specimens do not possess the anterior pair of lateral setigerous pores, it is possible that this condition is variable. It is also possible that the longer carina of the pronotum effects the absence of a setigerous pore, making this the only species of the group without pores but with a longer carina.

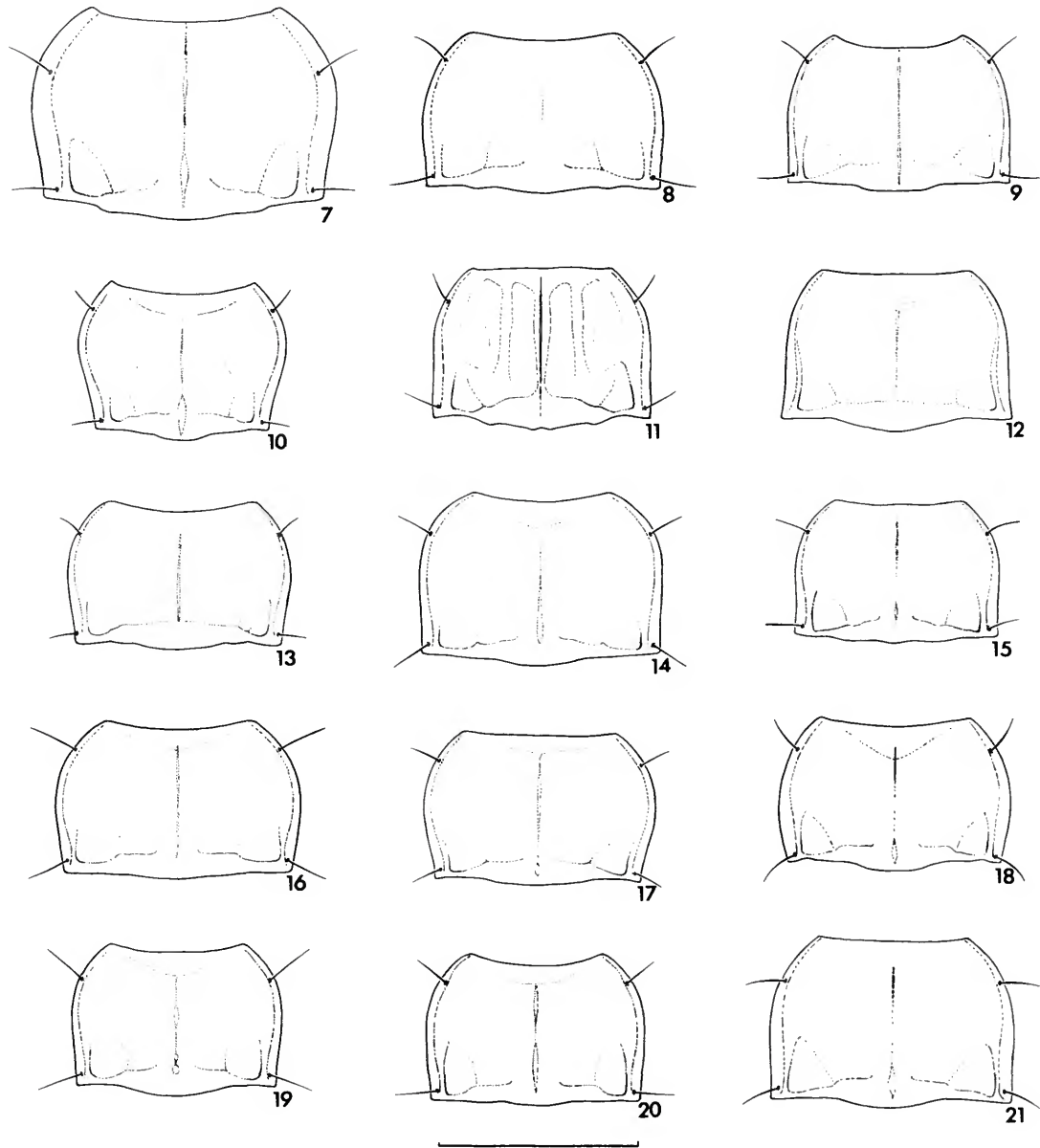
### 8. *Xystosomus aetholius*, new species

FIGURES 13, 30, 69

**TYPE-LOCALITY.**—Cochabamba, Bolivia.

**TYPE-SPECIMENS.**—The holotype male and allotype are in MHNP. These and the paratypes were





FIGURES 7-21.—Pronotum, dorsal aspect: 7, *Xystosomus ampliatus*, female, Hamburg Farm, Costa Rica; 8, *X. nigripalpis*, female, Barro Colorado Island, Panama; 9, *X. strigosus*, female, Rio Parahyba, Brazil; 10, *X. iris*, female, Cochabamba, Bolivia; 11, *X. sculpticollis*, female, Teffé, Brazil; 12, *X. negrei*, male, Rancho Grande, Venezuela; 13, *X. aetholius*, female, Cochabamba, Bolivia; 14, *X. anterocostis*, Hamburg Farm, Costa Rica; 15, *X. sublaevis*, male, Río Banano, Costa Rica; 16, *X. sulcicostis*, female, Volcán de Chiriquí, Panama; 17, *X. apicisulcatus*, female, Minas, Brazil; 18, *X. batesi*, female, Petrópolis, Brazil; 19, *X. seriatus*, female, Nova Teutonia, Brazil; 20, *X. ovatulus*, female, Caraca, Brazil; 21, *X. grossipunctatus*, female, Caraca, Brazil.

collected by P. Germain (no date). Paratypes (31): MHNP, 22; USNM, 9.

**DESCRIPTION.**—*Form*: As in *X. gruti*, except elytra slightly more convex. Easily distinguished from all other species of the group by the complete lack of elytral striae.

*Color*: Head and body rufous, pronotum and elytra slightly iridescent, appendages testaceous.

*Head*: Broad between eyes; frontal furrows moderately impressed; eyes large and prominent.

*Pronotum* (Figure 13): Slightly transverse (W/L,  $\bar{x}$  1.49; range, 1.41–1.60; 33 specimens), otherwise as in *X. gruti*.

*Elytra*: Striae absent; side margins broadly explanate; humeral projection small, blunt; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia characteristic of the species group (Figure 30). Female genitalia characteristic of the species group.

*Size*: Thirty-three specimens: length, 3.5–4.8 mm; width, 1.6–2.0 mm.

**VARIATION.**—The long series of specimens, all from the type locality, is remarkably homogeneous, except in size and proportions of the pronotum.

**NATURAL HISTORY.**—Unknown.

**LOCALITY RECORDS** (Figure 69).—I have seen 33 specimens from the following locality:

SOUTH AMERICA: BOLIVIA: Cochabamba (MHNP, USNM).

### 9. *Xystosomus anterocostis*, new species

FIGURES 14, 31, 69

**TYPE-LOCALITY.**—Hamburg Farm at Reventazón, Costa Rica.

**TYPE-SPECIMENS.**—The holotype male, allotype, and one female paratype are in USNM. All were collected by Nevermann.

**DESCRIPTION.**—*Form*: As in *X. gruti*, except elytra slightly more convex. Easily distinguished among the "smooth elytra-convex interval" group of species by the sinuate sides of the pronotum.

*Color*: Head and body piceous; pronotum and elytra moderately iridescent; appendages testaceous or slightly infuscated.

*Head*: Broad between eyes; frontal furrows deeply impressed, almost sulcate; eyes large and prominent.

*Pronotum* (Figure 14): Transverse (W/L,  $\bar{x}$  1.63;

range, 1.53–1.75; 3 specimens); otherwise as in *X. gruti*, except side margins sinuate at basal third.

*Elytra*: Striae 5–8 well impressed and punctulate; intervals convex, at least in basal third; disc with four rows of faintly impressed punctulae, each well separated from the other, intervals flat; side margins broadly explanate; humeral projection well developed, blunt; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia (Figure 31) and female genitalia characteristic of the species group.

*Size*: Three specimens: length, 3.3–3.6 mm; width, 1.6–1.8 mm.

**NATURAL HISTORY.**—F. Nevermann collected two specimens on "wilted foliage of *Quararibae turbinata*, October" (Bombacaceae) and one specimen "on dry leaves, September." No teneral specimens seen.

**LOCALITY RECORDS** (Figure 69).—I have seen three specimens from the following locality:

CENTRAL AMERICA: COSTA RICA: Hamburg Farm at Reventazón (USNM).

### 10. *Xystosomus sublaevis* Bates

FIGURES 15, 32, 69

*Xystosomus sublaevis* Bates, 1882:146. [Lectotype, female, BMNH, here selected. Eleven paralectotypes, labelled by me: BMNH, 8; MHNP, 3. Type-locality: Volcan de Chiriquí, Panama.]

**DESCRIPTION.**—*Form*: As in *X. gruti*, except elytra more convex and shorter. The members of this species are not easily distinguished from other members of the "smooth elytra-convex interval" group of species on any one character state. Members of *X. sublaevis* are without the sinuate pronotal sides of *X. anterocostis*, without the coarsely punctate elytral rows of *X. batesi*, without the highly convex lateral intervals of *X. sulcicostis*, with some traces of striae or serial punctures, and therefore not like *X. aetholius*.

*Color*: Head and body dark rufopiceous, shiny; pronotum and elytra slightly iridescent; appendages testaceous.

*Head*: Broad between eyes; frontal furrows short and sulcate; eyes large and prominent.

*Pronotum* (Figure 15): Transverse (W/L,  $\bar{x}$

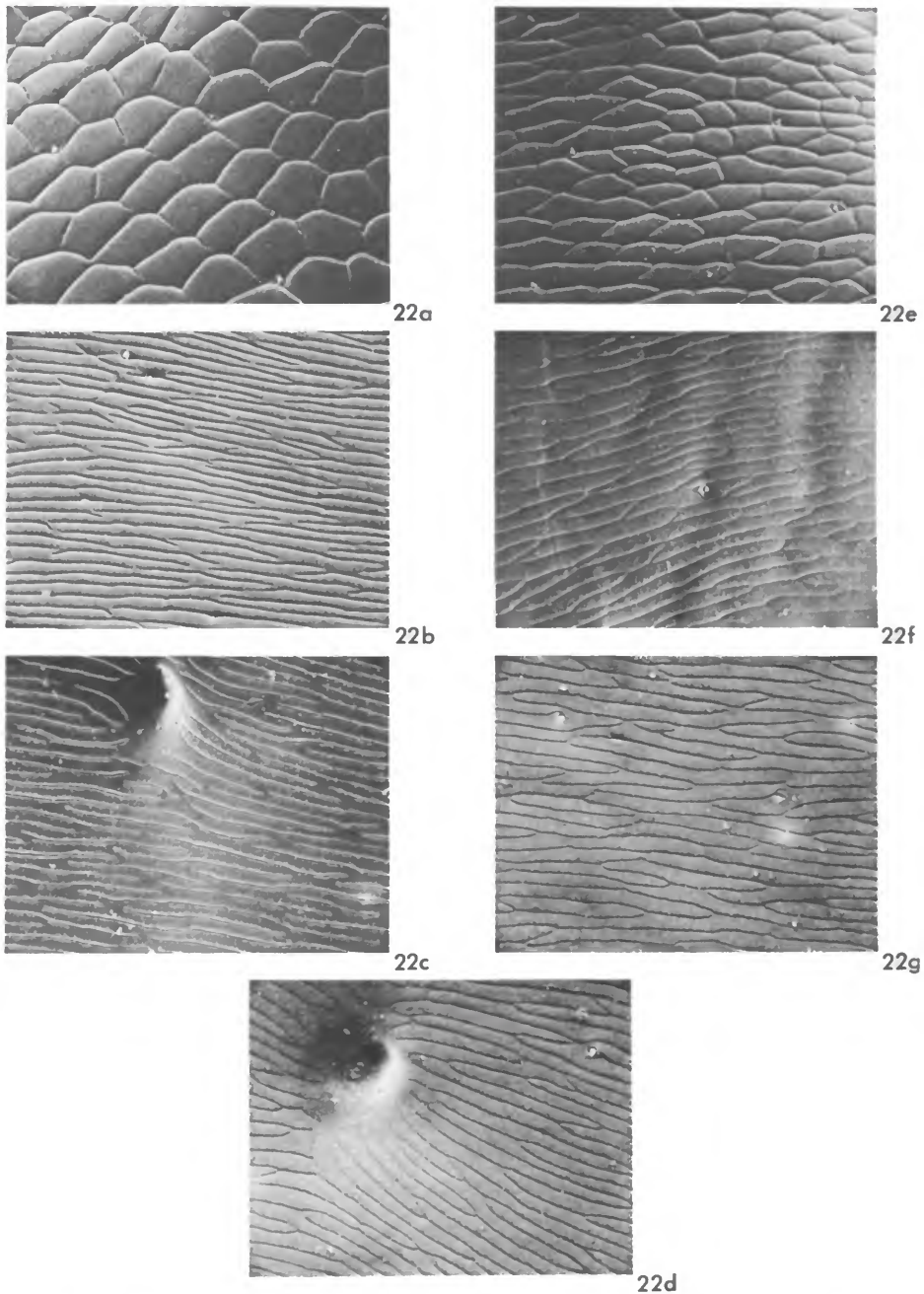
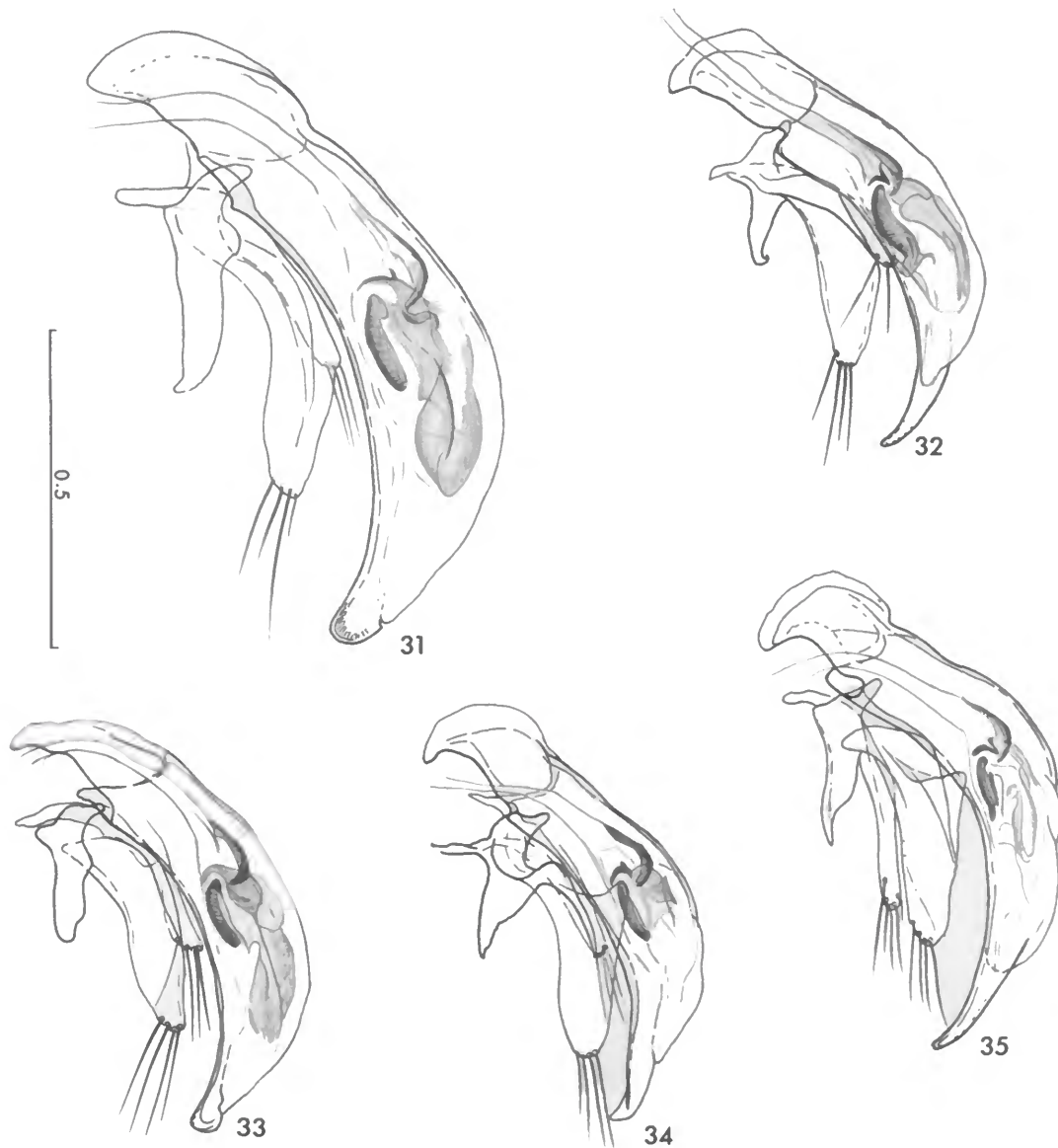


FIGURE 22.—Scanning electron micrographs (x1250) of dorsal microsculpture. *Xystosomus gruti*: a, frons; b, pronotal disc; c, disc of left elytron; note serial puncture. *Xystosomus turgidus*: d, frons; e, pronotal disc; f, disc of left elytron. *Xystosomus ovatulus*: g, disc of left elytron; note serial puncture.



FIGURES 23-30.—Male genitalia, left lateral aspect of seven species of the *gruti* group: 23, *Xystosomus gruti*, Volcán de Chiriquí, Panama; 24, *X. gruti*, apex of median lobe, Hamburg Farm, Costa Rica; 25, *X. nigripalpis*, Barro Colorado Island, Panama; 26, *X. strigosus*, Rio Parahyba, Brazil; 27, *X. iris*, Cochabamba, Bolivia; 28, *X. sculpticollis*, São Paulo d'Oliveira, Brazil; 29, *X. negrei*, Rancho Grande, Venezuela; 30, *X. aetholius*, Cochabamba, Bolivia.



FIGURES 31-35.—Male genitalia, left lateral aspect, of five species of the *gruti* group: 31, *Xystosomus anterocostis*, Hamburg Farm, Costa Rica; 32, *X. sublaevis*, Volcán de Chiriquí, Panama; 33, *X. sulcicostis*, Volcán de Chiriquí, Panama; 34, *X. seriatus*, Nova Teutonia, Brazil; 35, *X. ovatulus*, Nova Friburgo, Brazil.

1.58; range, 1.47–1.66; 9 specimens), otherwise as in *X. gruti*.

*Elytra*: Striae 5–8 faintly impressed and punctulate; intervals slightly convex; disc with four rows of faintly impressed punctulae, each separated from the other by several times its own diameter; interstices between serial punctures striate or not; side margins broadly explanate; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia (Figure 32) and female genitalia characteristic of the species group.

*Size*: Nine specimens: length, 3.0–3.5 mm; width, 1.4–1.6 mm.

**NATURAL HISTORY.**—The specimen from Costa Rica was collected in April at 250 meters elevation. The original series of Bates was collected in Panama at 800 to 4,000 feet (244 to 1,220 m) elevation, but no date was recorded. No teneral specimens were seen.

**LOCALITY RECORDS** (Figure 69).—I have seen 16 specimens from the following localities:

**CENTRAL AMERICA: COSTA RICA:** Río Banano (USNM).  
**PANAMA:** Bugaba (BMNH, MHNP); Volcán de Chiriquí (BMNH, MHNP).

### 11. *Xystosomus sulcicostis* Bates

FIGURES 16, 33, 69

*Xystosomus sulcicostis* Bates, 1882:146. [Lectotype, female, BMNH, here selected. Eleven paralectotypes, labelled by me: BMNH, 7; MHNP, 4. Type-locality: Volcán de Chiriquí, Panama.]

**DESCRIPTION.**—*Form*: As in *X. gruti*, except elytra much shorter and convex. Easily distinguished by the extended lateral intervals of the elytra; other similar species with smooth elytra have the convex intervals in basal half only.

*Color*: Head and body piceous; pronotum and elytra moderately iridescent; appendages testaceous.

*Head*: Broad between eyes; frontal furrows well impressed, sulcate posteriorly; eyes large and prominent.

*Pronotum* (Figure 16): Transverse (W/L,  $\bar{x}$  1.60; range, 1.47–1.68; 7 specimens), otherwise as in *X. gruti*.

*Elytra*: Striae 1–4 faintly impressed and faintly punctulate; intervals flat; striae 5–8 deeply impressed, almost sulcate between highly convex in-

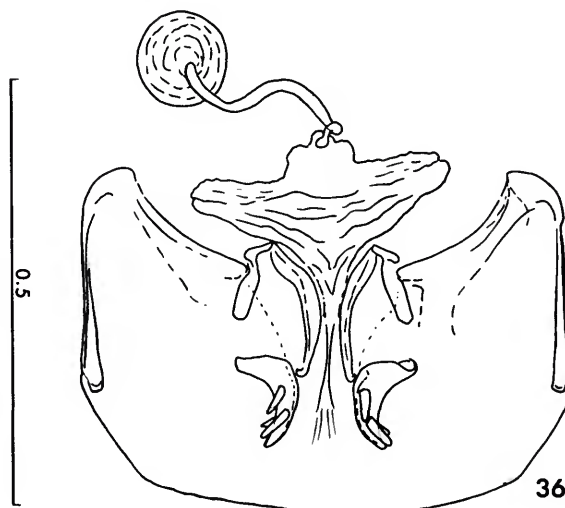


FIGURE 36.—Female genitalia, ventral aspect, with spermathecal reservoir, of *Xystosomus gruti*, Volcán de Chiriquí, Panama.

tervals, and faintly punctulate; otherwise as in *X. gruti*.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia (Figure 33) and female genitalia characteristic of the species group.

*Size*: Seven specimens: length, 3.2–3.7 mm; width, 1.5–1.8 mm.

**NATURAL HISTORY.**—Unknown, except that Bates' series was collected between 2,000 and 4,000 feet (610–1,220 m) elevation.

**LOCALITY RECORDS** (Figure 69).—I have seen twelve specimens from the following locality:

**CENTRAL AMERICA: PANAMA:** Volcán de Chiriquí (BMNH, MHNP).

### 12. *Xystosomus apicisulcatus*, new species

FIGURES 17, 69

**TYPE-LOCALITY.**—Minas, Brazil.

**TYPE-SPECIMEN.**—The unique holotype female is in MHNP. It was collected by Squires.

**DESCRIPTION.**—*Form*: As in *X. gruti*. Easily distinguished from all species in the group by the sulcate apex of the sutural stria.

*Color*: Head and body piceous; pronotum and elytra slightly iridescent; appendages testaceous.

*Head:* Narrow between eyes; frontal furrows shallowly impressed; eyes very large and prominent.

*Pronotum* (Figure 17): Transverse (W/L, 1.61; 1 specimen); hind angles obtuse, sides anterior to angles more or less straight; side margins moderately explanate in basal half, beaded anteriorly; otherwise as in *X. gruti*.

*Elytra:* Each elytron with seven rows of partially striate serial punctulae; stria 8 deeply impressed, almost sulcate; recurrent groove very deeply sulcate and hooked at apex; apex of sutural and second row of punctulae deeply sulcate; side margins broadly explanate; humeral projection well developed, obtuse; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture:* Pronotum with coarsely impressed transverse meshes, nearly isodiametric along anterior margin; otherwise as in *X. gruti*.

*Secondary sexual characters:* Male genitalia unknown. Female genitalia characteristic of the species group.

*Size:* One specimen: length, 3.8 mm; width, 1.6 mm.

NATURAL HISTORY.—Unknown.

LOCALITY RECORDS (Figure 69).—I have seen only the unique type from Minas, Brazil.

### 13. *Xystosomus batesi*, new species

FIGURES 18, 69

TYPE-LOCALITY.—Petrópolis, Brazil.

TYPE-SPECIMEN.—The unique holotype female, collected by Sahlberg, is in MHNP.

DESCRIPTION.—*Form:* As in *X. gruti*, except shorter. Easily distinguished by the absence of elytral microsculpture and the short frontal furrows.

*Color:* Head and body piceous; pronotum and head shiny; appendages testaceous or partly infuscated.

*Head:* Narrow between eyes; frontal furrows deeply impressed, short, extended to mid-eye level; eyes large and prominent.

*Pronotum* (Figure 18).—Transverse (W/L, 1.61; 1 specimen); hind angles slightly obtuse; sides anterior to angles slightly arcuate; otherwise as in *X. gruti*.

*Elytra:* Each elytron with seven rows of serial punctulae; stria 8 well impressed, coarsely punctate

in basal half; punctulae of disc smaller and less impressed than those laterally, all rows effaced before apex; intervals flat, except interval 8 which is slightly convex; side margins broadly explanate; humeral tooth well developed, rounded; chaetotaxy as in *X. gruti*; plica small, evident externally.

*Microsculpture:* Head and pronotum as in *X. gruti*, except faintly impressed on pronotum; effaced from elytra.

*Secondary sexual characters:* Male genitalia unknown. Female genitalia characteristic of the species group.

*Size:* One specimen: length, 3.4 mm; width, 1.7 mm.

NATURAL HISTORY.—Unknown.

LOCALITY RECORDS (Figure 69).—I have seen only the unique type from Petrópolis, Brazil.

### 14. *Xystosomus seriatus*, new species

FIGURES 19, 34, 69

TYPE-LOCALITY.—Nova Teutonia, Santa Catarina, Brazil.

TYPE-SPECIMENS.—The holotype male and allotype are in BMNH. Both were collected by Plaumann in 1934. Two paratypes: BMNH, 1; MHNP, 1.

DESCRIPTION.—*Form:* As in *X. gruti*, except elytra more convex. Easily distinguished from all species of the group by the complete lack of pronotal and elytral microsculpture.

*Color:* Head and body rufopiceous; pronotum and elytra very shiny; appendages testaceous or partially infuscated.

*Head:* Narrow between eyes; frontal furrows linear and deeply impressed, extended to past mid-eye level; eyes large and prominent.

*Pronotum* (Figure 19): Transverse (W/L,  $\bar{x}$  1.52; range, 1.47–1.57; 4 specimens); hind angles slightly obtuse; sides anterior to angles straight; side margins slightly explanate basally, beaded anteriorly; otherwise as in *X. gruti*.

*Elytra:* Each elytron with eight rows of serial punctulae, laterally more coarsely punctulate and partially or totally striate (especially striae 7 and 8); discal intervals flat, lateral intervals slightly convex; otherwise as in *X. gruti*.

*Microsculpture:* Head with slightly transverse, finely impressed meshes, more isodiametric near clypeus; effaced from pronotum and elytra.

*Secondary sexual characters:* Male genitalia (Figure 34) and female genitalia characteristic of the species group.

*Size:* Four specimens: length, 3.0–3.4 mm; width, 1.4–1.5 mm.

*NATURAL HISTORY.*—Unknown, except adults collected in March and May. The specimen collected in May is slightly teneral.

*LOCALITY RECORDS* (Figure 69).—I have seen four specimens from the following locality:

SOUTH AMERICA: BRAZIL: Santa Catarina State: Nova Teutonia (BMNH, MHNP).

### 15. *Xystosomus ovatulus* Bates

FIGURES 20, 22g, 35, 69

*Xystosomus ovatulus* Bates, 1871a:247. [Lectotype, female, MHNP, here selected. Type-locality: Rio de Janeiro, Brazil.]

*DESCRIPTION.*—*Form:* As in *X. gruti*, except elytra more convex. Easily distinguished from all species of the group by the punctate elytra along with the coarse, meshed microsculpture which produces a matte-like finish on the elytra.

*Color:* Head and body piceous; forebody slightly darker than elytra especially toward apex of elytra; pronotum and elytra slightly iridescent; appendages testaceous.

*Head:* Narrow between eyes; frontal furrows deeply impressed, extended to just beyond mideye level; eyes large and prominent.

*Pronotum* (Figure 20): Transverse (W/L,  $\bar{x}$  1.49; range, 1.38–1.52; 6 specimens); hind angles acute, denticulate, sides anterior to angles straight; side margins narrowly explanate to anterior lateral setigerous pores; otherwise as in *X. gruti*.

*Elytra:* Each elytron with eight rows of serial punctulae impressed at least in basal two-thirds; punctulae separated by their own diameter or more; extreme apex of row 2 sulcate; otherwise as in *X. gruti*.

*Microsculpture:* As in *X. gruti* except lines joined to form meshes on elytra (Figure 22g).

*Secondary sexual characters:* Male genitalia (Figure 35) and female genitalia characteristic of the species group.

*Size:* Six specimens: length, 3.4–4.0 mm; width, 1.6–1.8 mm.

*NATURAL HISTORY.*—Unknown, except adults

were collected in February and the “second quarter” of the year.

*LOCALITY RECORDS* (Figure 69).—I have seen seven specimens from the following localities:

SOUTH AMERICA: BRAZIL: Minas Gerais Province: Rio Piracicaba (MHNP); Caraca (MHNP). Rio de Janeiro Province: Nova Friburgo (MHNP).

### 16. *Xystosomus grossipunctatus*, new species

FIGURES 21, 69

*TYPE-LOCALITY.*—Caraca, Minas Gerais, Brazil.

*TYPE-SPECIMEN.*—The unique holotype female is in MHNP. It was collected by Germain.

*DESCRIPTION.*—*Form:* As in *X. gruti*, except elytra more convex. Easily distinguished by the large coarse punctures of the elytra along with the completely microsculptured dorsum.

*Color:* Forebody piceous; elytra rufopiceous; pronotum and elytra slightly iridescent; appendages testaceous.

*Head:* Broad between eyes; frontal furrows deeply impressed and linear, separated from eye by strongly developed carina; eyes medium-sized, moderately prominent.

*Pronotum* (Figure 21): Transverse (W/L, 1.45); hind angles about 90°, sides anterior to angles, straight; otherwise as in *X. gruti*.

*Elytra:* Each elytron with seven rows of serial punctures; laterally, punctures coarser and more deeply impressed; all rows effaced at apical sixth; row 8 absent; all intervals flat; side margins broadly explanate; humeral tooth well developed, blunt; chaetotaxy as in *X. gruti*; plica long, evident externally.

*Microsculpture:* As in *X. gruti*.

*Secondary sexual characters:* Male genitalia unknown. Female genitalia characteristic of the species group.

*Size:* One specimen: length, 4.1 mm; width, 1.7 mm.

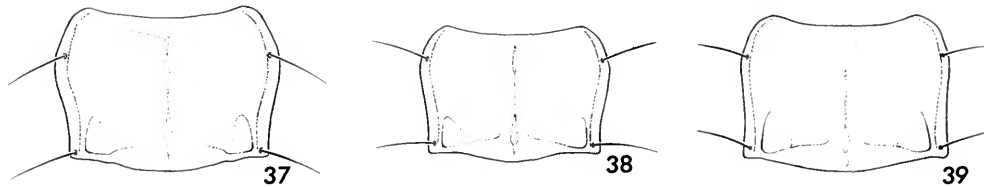
*NATURAL HISTORY.*—Unknown.

*LOCALITY RECORDS* (Figure 69).—I have seen only the unique type from Caraca, Minas Gerais Province, Brazil.

### The *elaphrinus* group

The members of the *elaphrinus* group are characterized by the following: huge hemispherical





FIGURES 37-39.—Pronotum, dorsal aspect: 37, *Xystosomus elaphrinus*, male, Roches de Kourou, French Guiana; 38, *X. notiophiloides*, female, Jatahy, Brazil; 39, *X. spangleri*, female, 9.0 miles west of Los Algarrobos, Panama.

eyes; narrow, almost square pronotum (narrower than head across eyes); nonsulcate prosternal process; and fully developed flight wings.

The characteristics of the internal sac of the male genitalia, including the presence of a "brush sclerite," correspond to those in the members of the *gruti* group. With the exception of the apex of the stylus, the characteristics of the female genitalia also correspond to those in the members of the *gruti* group. In the *elaphrinus* group, the apex is blunt, with the lateral spines exceeding it in length.

Presently known to represent this group are three species with a combined distribution (Figure 70) from Costa Rica to Brazil.

### 17. *Xystosomus elaphrinus* Bates

FIGURES 1, 37, 40, 42, 70

*Xystosomus elaphrinus* Bates, 1871b:267. [Lectotype, male, in MHNP, here selected. Type-locality: Ega (Teffé), Brazil.]

**DESCRIPTION.**—*Form*: Similar to members of the holarctic genus *Elaphrus*, with broad elytra, narrow pronotum, and huge eyes.

*Color*: Head and body piceous; pronotum and elytra with metallic green luster; appendages testaceous or piceous or bicolored.

*Head*: Broad between eyes; frontal furrows well impressed and separated from eye by a linear costa; eyes huge and hemispherical.

*Pronotum* (Figures 1, 37): Quadrate (W/L,  $\bar{x}$  1.45; range, 1.35–1.53; 29 specimens); lateral setigerous pores present just anterior to middle and at hind angles; laterobasal carina well developed; hind angles sharp, acute, sides anterior to angles sinuate; side margins broadly explanate to lateral setigerous pores, narrowly explanate anterior to pores.

*Elytra*: Each elytron with eight rows of serial

punctures, the lateral three or four rows also striate in part; punctulae and punctures larger and more coarsely impressed in rows 3–8 at base; all rows finer or effaced at apex; lateral intervals convex, discal intervals flat, intervals between coarse basal punctures uneven and partially convex; side margins broadly explanate; humeral projection well developed, obtuse; chaetotaxy as in *X. gruti*; plica short, evident externally.

*Microsculpture*: As in *X. gruti*, except more finely impressed or nearly effaced in part; head shiny and without meshes.

*Secondary sexual characters*: Male genitalia characteristic of *gruti* group members in internal sac; median lobe larger, more twisted, and with bent apex (Figure 40). Female genitalia as in *X. gruti*, except stylus (Figure 42) blunt at apex, exceeded in length by lateral spines.

*Size*: Twenty-nine specimens: length, 3.7–4.3 mm; width, 1.6–1.9 mm.

**VARIATION.**—The specimens I have seen can be divided into two groups on the basis of elytral punctation and leg color. One morph (all specimens south of the Amazon Basin or in the southern part of it) has each elytron with eight entire rows of numerous small serial punctulae with small, non-coarse punctures basally in rows 4–6. This morph has testaceous legs. The other morph (all specimens from French Guiana north) has each elytron with eight abbreviated rows of either small punctulae (rows 1 and 2) or large, coarse, well-impressed punctures (rows 3–8) with only rows 7 and 8 entire; rows 1–6 effaced in apical half. This morph has piceous or darkly infuscated legs.

Unfortunately, all "pale-legged morph" specimens are females. Further material, especially males, may clarify the situation and indicate

whether the southern form is conspecific (or perhaps subspecific). The type-specimen is from an intermediate area, but it agrees in all respects to the northern "dark-legged morph."

**NATURAL HISTORY.**—Adults were collected January to March, in May, July to September, and in November. One teneral specimen was collected in July. Nevermann recorded four specimens from "under loose bark, January, July, September, November"; one specimen "on tree fungus, February"; one specimen "off pieces of bark, May"; and one specimen "at light, May."

**DISTRIBUTION** (Figure 70).—The range of this species extends from Costa Rica to the Amazon Basin in lowland tropical forests.

**LOCALITY RECORDS** (Figure 70).—I have seen 30 specimens from the following localities:

**CENTRAL AMERICA:** COSTA RICA: Hamburg Farm at Reventazón (USNM); Lasmercedes (USNM). PANAMA: Bugaba (MHNP); Cabima (USNM); Matachin (MHNP). **SOUTH AMERICA:** BRAZIL: Amazonas Province: Teffé (MHNP). Goyaz Province: Jatahy (MHNP), Rio Verde (MHNP). Pará Province: Baragance (MHNP). **BRITISH GUIANA:** Bartica (MHNP); Kartabo Point (MCZ). **COLOM-**

**BIA:** San Carlos (MHNP). **FRENCH GUIANA:** Cayenne (MHNP); Roches de Kourou (MHNP).

### 18. *Xystosomus notiophiloides*, new species

FIGURES 38, 70

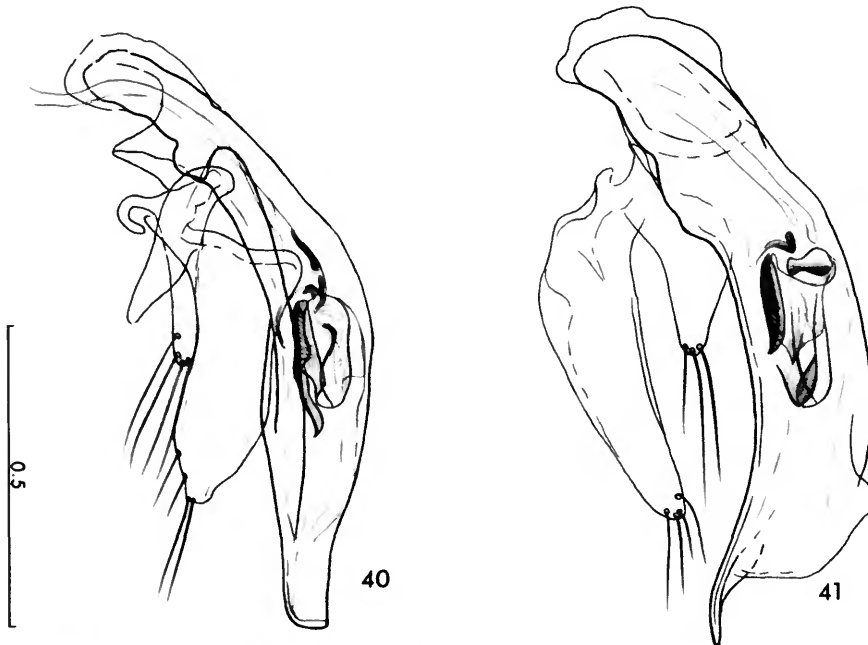
**TYPE-LOCALITY.**—Jatahy, Goyaz Province, Brazil.

**TYPE-SPECIMENS.**—The holotype female is in MHNP. Three paratypes: MHNP, 2; USNM, 1. All four were collected by Donckier in 1903.

**DESCRIPTION.**—*Form:* As in *X. elaphrinus*, although smaller and flatter; superficially resembling members of genus *Notiophilus*. Easily distinguished from the other two species of the group by the elytra, each of which has eight serial rows of small, even punctulae entire to apex.

*Color:* Head and body piceous; entire dorsal surface of head and body shiny with metallic green luster; appendages testaceous or partially infuscated.

*Head:* Very broad between eyes; frontal furrows moderately impressed and separated from eye by small rounded costae; eyes huge and hemispherical.



FIGURES 40, 41.—Male genitalia, left lateral aspect: 40, *Xystosomus elaphrinus*, Kartabo Point, British Guiana; 41, *X. spangleri*, 9.0 miles west of Los Algarrobos, Panama.



FIGURE 42.—Female genitalia, ventral aspect, left side, of *Xystosomus elaphrinus*, Lasmercedes, Costa Rica.

*Pronotum* (Figure 38): Quadrate (W/L,  $\bar{x}$  1.51; range, 1.47–1.57; 4 specimens); otherwise as in *X. elaphrinus*.

*Elytra*: Each elytron with eight serial rows of small, even punctulae, each entire to apex; lateral rows more impressed than discal rows; otherwise as in *X. elaphrinus*.

*Microsculpture*: As in *X. elaphrinus*, except head with faintly impressed, nearly isodiametric meshes.

*Secondary sexual characters*: Male genitalia unknown. Female genitalia characteristic of the species group.

*Size*: Four specimens: length 3.2–3.5 mm; width, 1.36–1.40 mm.

*NATURAL HISTORY*.—Unknown, except adults collected in March. No teneral specimens seen.

*LOCALITY RECORDS* (Figure 70).—I have seen four specimens from the following locality:

*SOUTH AMERICA: BRAZIL*: Goyaz Province: Jatahy (MHNP, USNM).

### 19. *Xystosomus spangleri*, new species

FIGURES 39, 41, 70

*TYPE-LOCALITY*.—Nine miles west of Los Algarobos (near Río San Pedro), Panama.

*TYPE-SPECIMENS*.—The holotype male and allotype are in USNM. Both were collected by P. J. Spangler in July 1967.

*DESCRIPTION*.—*Form*: As in *X. elaphrinus*, although flatter. Easily distinguished from the other two species of the group by the very shallowly im-

pressed rows 7 and 8 of elytral punctulae.

*Color*: Head and body piceous; dorsal surface shiny and with metallic green luster; appendages piceous.

*Head*: Very broad between eyes; frontal furrows shallowly impressed and separated from eyes by small rounded costae; eyes huge and hemispherical.

*Pronotum* (Figure 39): Quadrate (W/L, 1.36; range 1.33–1.39; 2 specimens); otherwise as in *X. elaphrinus*.

*Elytra*: Each elytron with eight serial rows of fine punctulae, all except row 8 effaced before apex; rows 6 and 7 almost effaced throughout; otherwise as in *X. elaphrinus*.

*Microsculpture*: As in *X. elaphrinus*, except almost effaced from elytra and more engraved on head.

*Secondary sexual characters*: Male genitalia (Figure 41) and female genitalia characteristic of the species group.

*Size*: Two specimens: length, 3.72–3.76 mm; width, 1.48–1.56 mm.

*NATURAL HISTORY*.—The two known specimens were collected in July in open country (either near a small pond or in grassland beneath cow patties), not in association with trees (P. J. Spangler and O. S. Flint, personal communications).

*ETYMOLOGY*.—I take pleasure in naming this species after my colleague, Paul J. Spangler, who collected the types.

*LOCALITY RECORDS* (Figure 70).—I have seen two specimens from the following locality:

*CENTRAL AMERICA: PANAMA*: Nine miles west of Los Algarobos, near Río San Pedro (USNM).

### The *microtretus* group

The members of the *microtretus* group are characterized by their small eyes, the lack of anterior pair of lateral setigerous pores on the pronotum, the presence of rudimentary laterobasal carinae on the pronotum, nonsulcate prosternum, fully developed flight wings, more broadly dilated articles of the male anterior tarsi, form of the recurrent groove, and peculiar male genitalia. When more specimens, and perhaps additional species, are known of this group, a subgeneric designation may be necessary.

The group presently consists of two species, one in Costa Rica and one in Brazil (Figure 70).

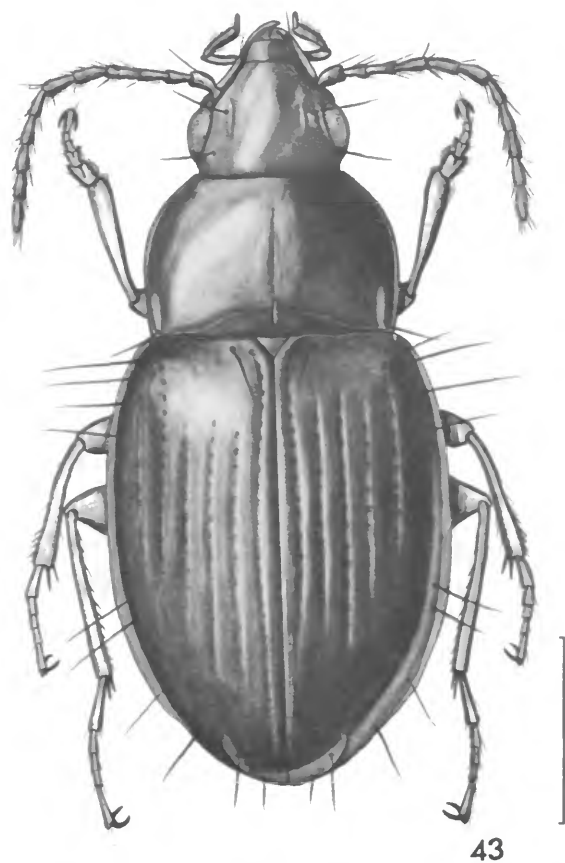


FIGURE 43.—Habitus of *Xystosomus microtretus*, male, Hamburg Farm, Costa Rica.

20. *Xystosomus microtretus*, new species

FIGURES 43, 45, 46, 70

**TYPE-LOCALITY.**—Hamburg Farm, Reventazón, Costa Rica.

**TYPE-SPECIMENS.**—The holotype male, allotype, and one paratype male are in USNM. They were collected by Nevermann in 1925, 1934, and 1932, respectively.

**DESCRIPTION.**—*Form* (Figure 43): Medium-sized, broad, moderately convex (more so than *X. gruti*), with small flat eyes, narrow head, broad pronotum, and square humeri. Easily distinguished from the other species of the group (see below) by the form of the pronotum.

**Color:** Head and body rufopiceous; pronotum

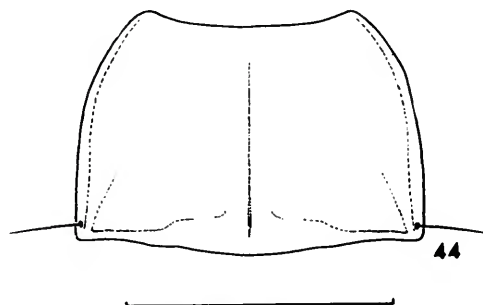


FIGURE 44.—Pronotum, dorsal aspect, of *Xystosomus polytretus*, female, Nova Friburgo, Brazil.

and elytra moderately iridescent; appendages testaceous.

**Head:** Very broad between eyes; frontal furrows shallowly impressed posterior to clypeus, not prolonged onto frons beyond anterior margin of eye; eyes small, slightly prominent.

**Pronotum** (Figure 43): Transverse (W/L,  $\bar{x}$  1.58; range, 1.53–1.68; 3 specimens); lateral setigerous pores present only at hind angles; laterobasal carinae rudimentary; hind angles about 90°, sides anterior to angles more or less straight; side margins beaded, not reflexed.

**Elytra:** Each elytron with six rows of partially striate serial punctures and punctulae, rows 2–6 effaced before apex; side margins narrowly explanate; humeral projection absent, humerus evenly rounded; chaetotaxy as in *X. gruti*; plica short, evident externally.

**Microsculpture:** As in *X. gruti*.

**Secondary sexual characters:** Male genitalia (Figure 45) with internal sac quite different than in members of other species groups. Female genitalia (Figure 46) characteristic of the species group.

**Size:** Three specimens: length, 3.3–3.6 mm; width, 1.6–1.7 mm.

**NATURAL HISTORY.**—Adults were collected in January and February. No teneral specimens were seen. Nevermann recorded the finding of these beetles from “under loose bark,” “on forest soil,” and “sifted from soil.”

**LOCALITY RECORDS** (Figure 70).—I have seen three specimens from the following locality:

**CENTRAL AMERICA:** COSTA RICA: Hamburg Farm at Reventazón (USNM).



FIGURE 45.—Male genitalia, left lateral aspect, of *Xystosomus microtretus*, Hamburg Farm, Costa Rica.

21. *Xystosomus polytretus*, new species

FIGURES 44, 70

TYPE-LOCALITY.—Nova Friburgo, Rio de Janeiro, Brazil.

TYPE-SPECIMEN.—The unique holotype female is in MHNP. It was collected by P. Germain in 1884.

DESCRIPTION.—*Form*: As in *X. microtretus*, but easily distinguished by the form of the pronotum, smaller eyes, and presence of eight rather than six rows of punctures on each elytron.

*Color*: Head and body rufous; pronotum and elytra moderately iridescent; appendages testaceous.

*Head*: Very broad between eyes; frontal furrows shallowly impressed and prolonged to posterior margin of eye; separated from supraorbital setigerous pores by narrow and sharp carinae; eyes small and nearly flat.

*Pronotum* (Figure 44): Transverse-trapezoidal (W/L, 1.54); lateral setigerous pores present only at hind angles; laterobasal carinae rudimentary; hind angles about 90°, sides anterior to angles convergent to anterior angles; side margins narrowly explanate basally.

*Elytra*: Each elytron with eight rows of serial

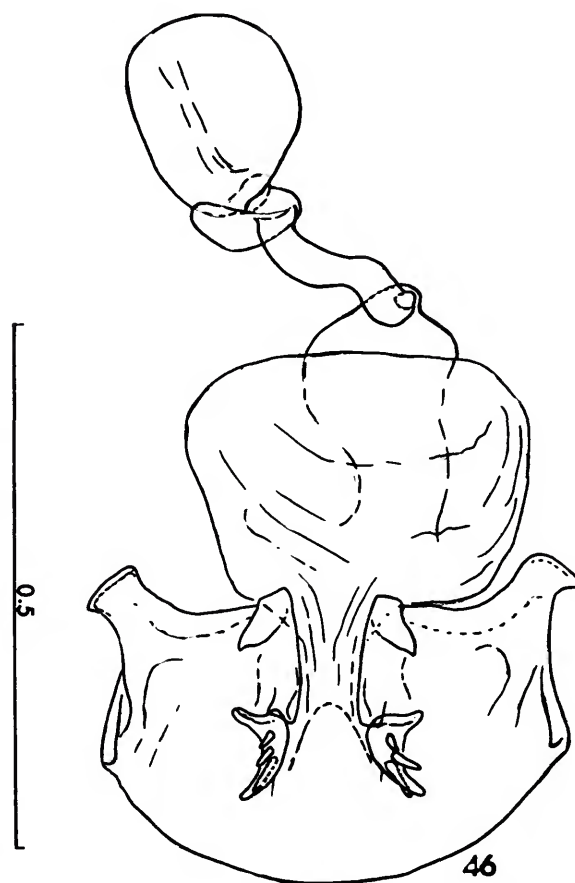


FIGURE 46.—Female genitalia, ventral aspect, with spermathecal reservoir, of *Xystosomus microtretus*, Hamburg Farm, Costa Rica.

punctures, rows 2–7 effaced before apex; punctures large and coarse, separated by about their own diameter; side margins moderately explanate; humeral projection small, obtuse; chaetotaxy as in *X. gruti*; plica long, evident externally.

*Microsculpture*: As in *X. gruti*.

*Secondary sexual characters*: Male genitalia unknown. Female genitalia characteristic of the species group.

*Size*: One specimen: length, 4.0 mm; width, 1.9 mm.

*NATURAL HISTORY*. Unknown, except the type was collected in "April-May." It is not teneral.

*LOCALITY RECORDS* (Figure 70).—I have seen only the unique type from Nova Friburgo, Brazil.

### The *parainsularis* group

The members of the *parainsularis* group are characterized by similarities of the male genitalia, female genitalia, and pronotal structure. Externally, the forms appear to be diverse for two reasons: first, the body form of *X. parainsularis* is narrow while that of *X. bisulcifrons* is broad; second, the elytra of *X. parainsularis* are smooth while those of *X. bisulcifrons* are punctate. The result of these diversities is a superficially different appearance of the two species. *Xystosomus parainsularis* is similar in appearance to *Tachymenis insularis* (Darlington) while *X. bisulcifrons* is similar to a mix of *gruti*, *inflatus*, and *microtretus* group members. However, the male genitalia of the two species in the *parainsularis* group are very similar and would

fall between those of the *gruti* group and *laevis* group if placed in a morphocline.

There are two known species representing this group, one from Brazil and one from Colombia-Venezuela (Figure 71).

### 22. *Xystosomus parainsularis*, new species

FIGURES 47, 49, 51, 71

TYPE-LOCALITY.—Colonia Tovar, Venezuela.

TYPE-SPECIMENS.—The holotype male and allotype are in MHNP. The holotype was collected by Simon in 1888. The allotype and two paratypes are simply labelled "Novo Gren." [Colombia], and two other paratypes are labelled "Colomb. Orient." Four paratypes: MHNP, 2; USNM, 2.

DESCRIPTION.—*Form*: Elongate and convex with broad head and narrow pronotum. Easily distinguished from the other species of the group by the smooth elytra.

*Color*: Head and body rufopiceous; pronotum and head slightly darker than the elytra; appendages testaceous; antennae slightly infuscated apically.

*Head*: Very broad between eyes; frontal furrows moderately impressed; eyes large and prominent.

*Pronotum* (Figure 47): Slightly transverse (W/L,  $\bar{x}$  1.45; range, 1.42–1.50, 6 specimens); lateral setigerous pores present at anterior third and at hind angles; laterobasal carinae well developed; hind angles obtuse, sides immediately anterior to angles slightly arcuate then straight; side margins slightly explanate.

*Elytra*: Smooth; chaetotaxy as in *X. inflatus*; plica small, evident externally.

*Microsculpture*: As in *X. inflatus*, except coarser on pronotum.

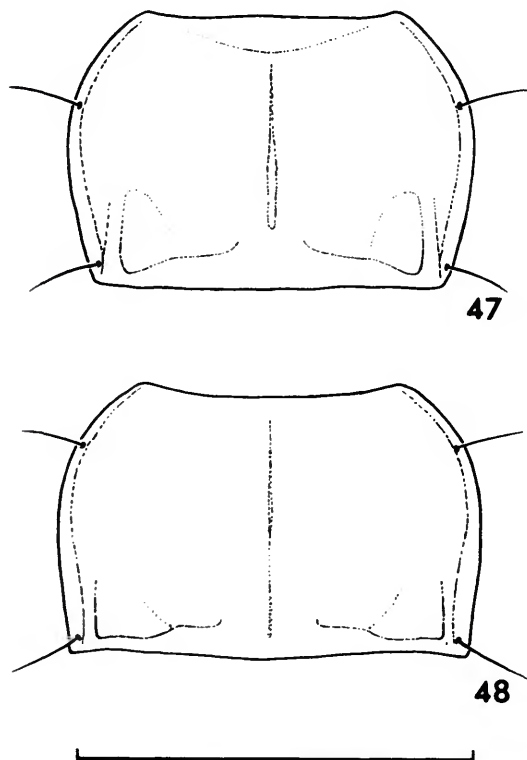
*Secondary sexual characters*: Male genitalia (Figure 49) and female genitalia (Figure 51) characteristic of the species group.

*Size*: Six specimens: length, 3.0–3.4 mm; width, 1.3–1.5 mm.

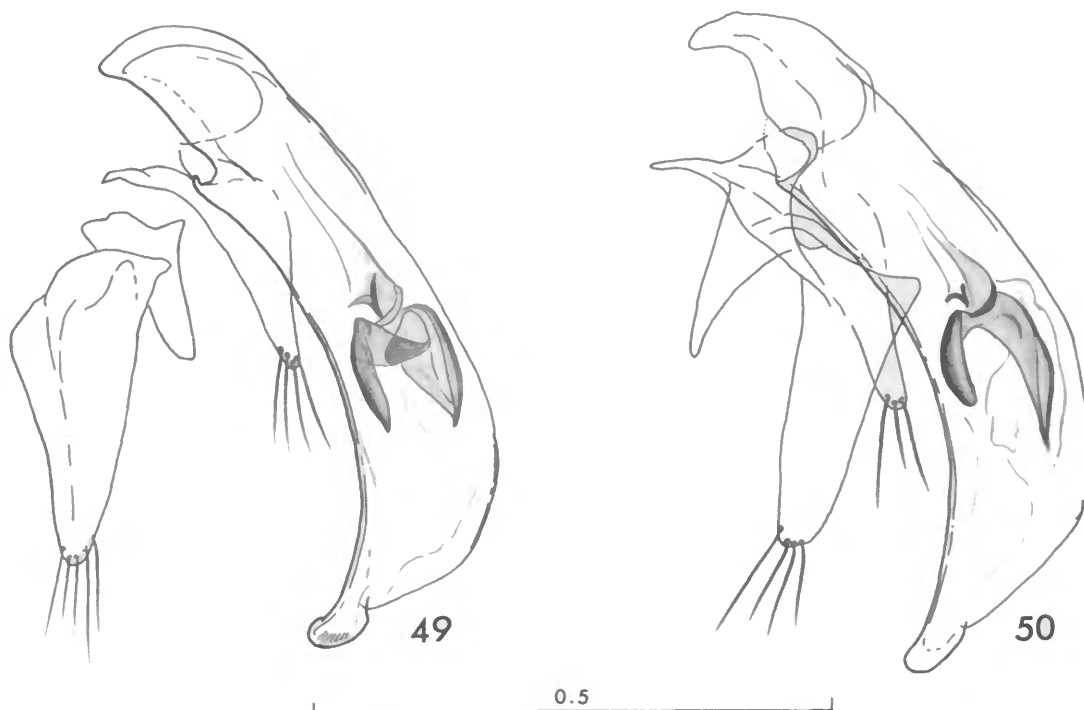
NATURAL HISTORY.—Unknown, except one adult collected in January. No teneral specimens seen.

LOCALITY RECORDS (Figure 71).—I have seen six specimens from the following localities:

SOUTH AMERICA: COLOMBIA: "Colomb." (MHNP); "Novo Gren." (MHNP, USNM). VENEZUELA: Colonia Tovar (MHNP).



FIGURES 47, 48.—Pronotum, dorsal aspect: 47, *Xystosomus parainsularis*, male, "Colombia Oriental"; 48, *X. bisulcifrons*, male, Rio Parahyba, Brazil.



FIGURES 49, 50.—Male genitalia, left lateral aspect: 49, *Xystosomus parainsularis*, Colonia Tovar, Venezuela; 50, *X. bisulcifrons*, Rio Parahyba, Brazil.

**23. *Xystosomus bisulcifrons*, new species**

FIGURES 48, 50, 71

**TYPE-LOCALITY.**—Parahyba River, Brazil.

**TYPE-SPECIMEN.**—The unique holotype male is in MHNP. It was collected by P. Germain in 1884 on “Rive gauche du Parahyba.”

**DESCRIPTION.**—*Form*: Broad and moderately convex with small head and more or less inflated elytra. Easily distinguished from the other species of this group (see below) by the punctate elytra.

*Color*: Head and body rufopiceous; pronotum and elytra slightly iridescent; appendages testaceous; femora slightly infuscated.

*Head*: Broad between eyes; frontal furrows moderately impressed, posteriorly convergent and sulcate; eyes medium-sized and slightly prominent.

*Pronotum* (Figure 48): Broadly transverse (W/L,  $\bar{x}$  1.66); otherwise as in *X. parainsularis*.

*Elytra*: Each elytron with six rows of serial punctulae, each striate in part; punctulae shallowly im-

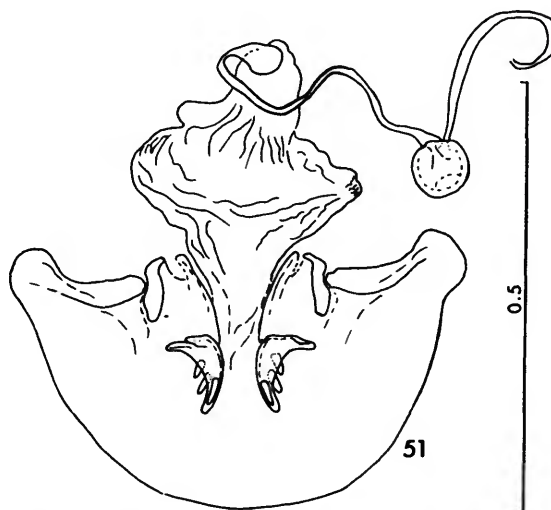


FIGURE 51.—Female genitalia, ventral aspect, with spermathecal reservoir, of *Xystosomus parainsularis*, Nueva Granada (Colombia).

pressed and separated by twice or more their own diameter; elytral-stria 8 present in apical third, deeply engraved, sulcate, nonpunctate; chaetotaxy as in *X. inflatus* except Eo5 and Eo6 with a sulcus between them; plica long, evident externally.

*Microsculpture*: As in *X. inflatus*, except slightly coarser.

*Secondary sexual characters*: Male genitalia (Figure 50) characteristic of the species group. Female unknown.

*Size*: Holotype: length, 3.4 mm; width, 1.6 mm.

*NATURAL HISTORY*.—Unknown, except the type was collected in September on the bank of a river.

*LOCALITY RECORDS* (Figure 71).—I have seen only the unique type from Parahyba River, Brazil.

### The *inflatus* group

With the exception of the bifoveate frons and the rather well-developed laterobasal carinae of the pronotum, the members of the *inflatus* group are very similar in appearance to the members of the *laevis* group. The male and female genitalia are of the same type, both groups are wingless, and both have partially fused elytra. These two groups, when better known, perhaps should be merged. I treat them as distinct groups here on the basis of the frons and pronotal structure. There are two known species of the *inflatus* group, both of which are known only from Brazil (Figure 72).

### 24. *Xystosomus inflatus* (Schaum)

FIGURES 52, 54, 55, 72

*Tachys inflatus* Schaum, 1859:202. [Lectotype, here selected, a female, in HUB. Type-locality: "Neufreiburg" (Nova Friburgo), Brazil.]

*DESCRIPTION*.—*Form*: Short and broad, highly convex, and with a small depressed head. Easily distinguished from the other species of the group by the well-developed laterobasal carinae of the pronotum and the deep triangular fova formed medial to the carina.

*Color*: Piceous, very shiny; appendages testaceous; antennal articles apically and femora slightly infuscated.

*Head*: Narrow between eyes; frontal furrows short, arcuate, ended at anterior supraorbital setigerous pore; frons with two deeply impressed foveae each side of midline; eyes depressed, medium-

sized, and prominent.

*Pronotum* (Figure 52): Broadly transverse (W/L,  $\bar{x}$  1.74; range 1.72–1.83; 7 specimens); lateral setigerous pores present just anterior to middle and at hind angles; laterobasal carinae well developed; hind angles obtuse, sides anterior to angles slightly arcuate; side margins beaded.

*Elytra*: Smooth, side margins narrowly reflexed; humeral projection absent, humerus evenly rounded or slightly concave posteriorly; chaetotaxy as in *X. laevis*; plica very small, evident externally.

*Microsculpture*: Frons with transversely stretched meshes; absent from pronotum and elytra.

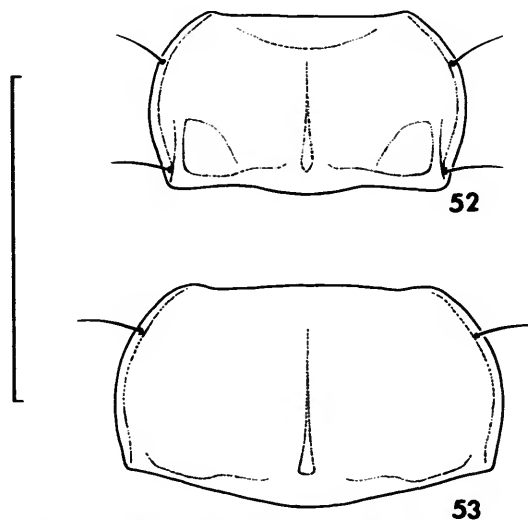
*Secondary sexual characters*: Male genitalia (Figure 54) and female genitalia (Figure 55) characteristic of the *inflatus* group.

*Size*: Eight specimens: length, 2.4–2.9 mm; width, 1.3–1.5 mm.

*NATURAL HISTORY*.—Unknown, except adults collected in September, April, and May. No teneral specimens seen.

*LOCALITY RECORDS* (Figure 72).—I have seen ten specimens from the following localities:

*SOUTH AMERICA: BRAZIL*: Rio de Janeiro Province: Nova Friburgo (MHNP); Rio de Janeiro (MHNP). Minas Gerais Province: Caraca (MHNP).



FIGURES 52, 53.—Pronotum, dorsal aspect: 52, *Xystosomus inflatus*, male, Caraca, Brazil; 53, *X. convexus*, female, Minas, Brazil.



25. *Xystosomus convexus*, new species

FIGURES 53, 72

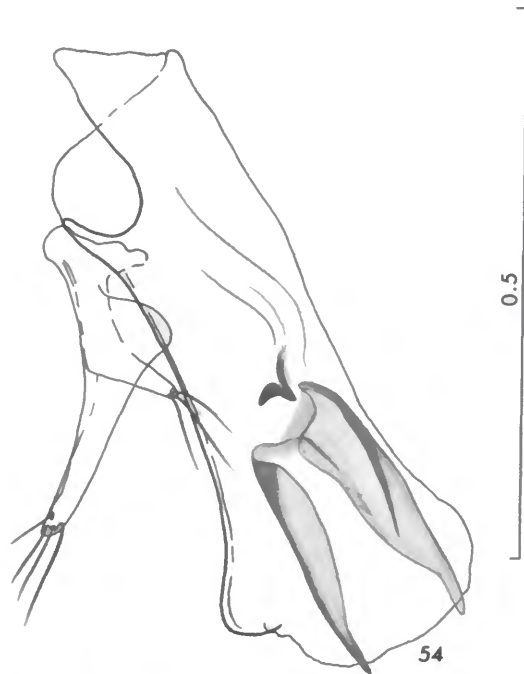
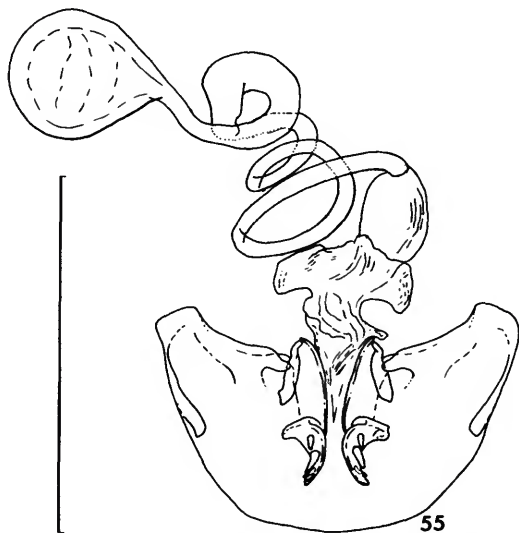
TYPE-LOCALITY.—Minas, Brazil.

TYPE-SPECIMEN.—The unique holotype, a female, is in MHNP. It was collected by Squires.

DESCRIPTION.—*Form*: As in *X. inflatus*, except broader and more highly convex, but easily distinguished by the small, sharp laterobasal carinae of the pronotum.*Color*: Head and body rufopiceous, shiny; appendages testaceous; antennal articles apically slightly infuscated.*Head*: As in *X. inflatus* except fovae shallower.*Pronotum* (Figure 53): Very transverse (W/L,  $\bar{x}$  1.82); laterobasal carinae small and very sharp; otherwise as in *X. inflatus*.*Elytra*: Smooth, highly convex; otherwise as in *X. inflatus*.*Microsculpture*: As in *X. inflatus*.*Secondary sexual characters*: Male genitalia unknown. Female genitalia not investigated because of the poor condition of the specimen.*Size*: The holotype: length, 2.9 mm; width, 1.6 mm.

NATURAL HISTORY.—Unknown.

LOCALITY RECORDS (Figure 72).—I have seen only the unique type from Minas, Brazil.

FIGURE 54.—Male genitalia, left lateral aspect, of *Xystosomus inflatus*, Caraca, Brazil.FIGURE 55.—Female genitalia, ventral aspect, with spermathecal reservoir, of *Xystosomus inflatus*, Nova Friburgo, Brazil.The *laevis* group

Members of the *laevis* group are characterized by their broadly transverse pronota, greatly inflated and globular elytra, and small heads, together with a complete lack of impressed elytral striae, absence or partial absence of lateral pronotal setigerous pores (exception is *X. impressifrons*, with both sets present), and absence of flight wings. Besides these external characteristics, the internal sac and the apex of the median lobe of the male genitalia share great similarities (see illustrations).

The concordance of the above-mentioned characteristics indicates that the *laevis* group is a natural group of rather closely related forms that probably underwent speciation after the loss of powers of flight. This view is further supported by the group's very small range. The group is known to be composed of seven species, all of which are found in Brazil south of the Amazon Basin (Figure 72).

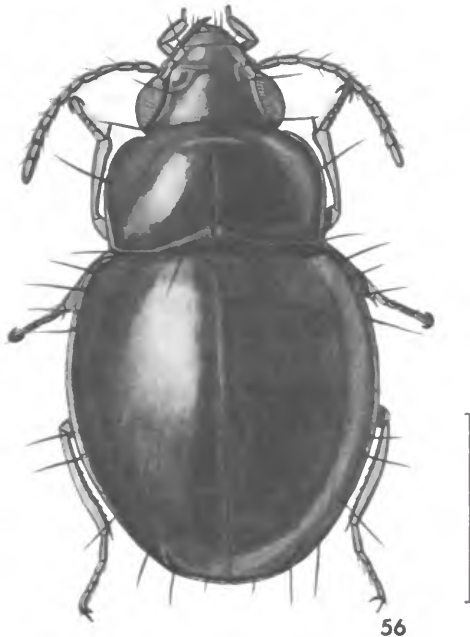


FIGURE 56.—Habitus of *Xystosomus impressifrons*, male, Lagoa de Saquarema, Brazil.

### 26. *Xystosomus laevis*, new species

FIGURES 22d, 56, 57, 63, 68, 72

TYPE-LOCALITY.—Nova Teutonia, Santa Catarina, Brazil.

TYPE-SPECIMENS.—The holotype male and allotype are in MCZ. Six paratypes: MCZ, 3; USNM, 3. All of the above specimens were collected by F. Plaumann in 1969.

DESCRIPTION.—*Form*: As in figure 56. Short and broad; highly convex; with short, broad pronotum and small head. Easily distinguished from all other species in the group by the small, acute, denticulate hind angles of the pronotum.

*Color*: Head and body rufous, very shiny; appendages testaceous; antennal articles infuscated apically.

*Head*: Broad between eyes; frontal furrows moderately impressed, posteriorly divergent; eyes medium-sized and flat.

*Pronotum* (Figure 57): Broadly transverse (W/L,  $\bar{x}$  1.73; range, 1.64–1.85; 8 specimens); only anterior pair of lateral setigerous pores present, at anterior third; hind angles small, acute, denticu-

late, sides anterior to angles evenly arcuate; side margins beaded, not reflexed.

*Elytra*: Smooth; side margins narrowly explanate; humeri evenly rounded; chaetotaxy formula Eo-1a, 2b, 3b, 4c, 5c, 6b, 7, 8a and Ed-1, 7b, 8; plica not evident externally.

*Microsculpture*: Frons with large, transversely stretched meshes (as in Figure 22d); pronotum and elytra without microsculpture.

*Secondary sexual characters*: Male genitalia (Figure 63) and female genitalia (Figure 68) characteristic of the species group.

*Size*: Eight specimens: length, 2.0–2.5 mm; width, 1.0–1.3 mm.

NATURAL HISTORY.—Unknown, except adults collected in December. Some of the specimens are teneral, indicating, at least, that the pupal stage occurs in December.

LOCALITY RECORDS (Figure 72).—I have seen eight specimens from the following locality:

SOUTH AMERICA: BRAZIL: Santa Catarina State: Nova Teutonia (MCZ, USNM).

### 27. *Xystosomus paralaevis*, new species

FIGURES 58, 72

TYPE-LOCALITY.—São Paulo, Brazil.

TYPE-SPECIMENS.—The holotype female is in MHNP. Nine female paratypes, all from the type-locality: BMNH, 1; MHNP, 5; USNM, 3.

DESCRIPTION.—*Form*: As in *X. laevis*, except pronotum broader (see below). Easily distinguished from all species of the group having no pronotal setae by the sharp hind angles of the pronotum along with evenly arcuate side margins of the pronotum and bright rufous integument.

*Color*: Head and body bright rufous; elytra slightly iridescent; appendages testaceous or slightly infuscated dorsally, antennae apically.

*Head*: Broad between eyes; frontal furrows shallowly impressed, divergent posteriorly; eyes medium-sized and flat.

*Pronotum* (Figure 58): Broadly transverse (W/L,  $\bar{x}$  1.83; range, 1.76–1.91; 10 specimens); lateral setigerous pores absent; hind angles sharp, about 90°, sides anterior to angles evenly arcuate; side margins beaded, not reflexed.

*Elytra*: Smooth, but some specimens with faint traces of striae on disc; otherwise as in *X. laevis*.

*Microsculpture*: As in *X. laevis*.

*Secondary sexual characters*: Male unknown. Female genitalia characteristic of the species group.

*Size*: Ten specimens: length, 1.9–2.2 mm; width, 1.0–1.2 mm.

*NATURAL HISTORY*.—Unknown, except one adult collected in July. No teneral specimens seen.

*LOCALITY RECORDS* (Figure 72).—I have seen ten specimens, all from the following locality:

*SOUTH AMERICA: BRAZIL*: São Paulo (BMNH, MHNP, USNM).

### 28. *Xystosomus laevimicans*, new species

FIGURES 59, 64, 72

*TYPE-LOCALITY*.—Alto da Serra, São Paulo, Brazil.

*TYPE-SPECIMENS*.—The holotype male and the allotype (from Santos, Brazil), are in BMNH. Both were collected by G. E. Bryant in 1912. Two paratypes, labelled same as the allotype: BMNH, 1; USNM, 1.

*DESCRIPTION*.—*Form*: As in *X. laevis*, except flatter and forebody narrower. Easily distinguished

by the form of the pronotum with its basally convergent sides.

*Color*: Rufous; pronotum and elytra slightly iridescent; appendages testaceous; antennae slightly infuscated apically.

*Head*: Broad between eyes; frontal furrows short, foviform, not prolonged beyond anterior supraorbital setigerous pore; eyes small, large-faceted, slightly prominent.

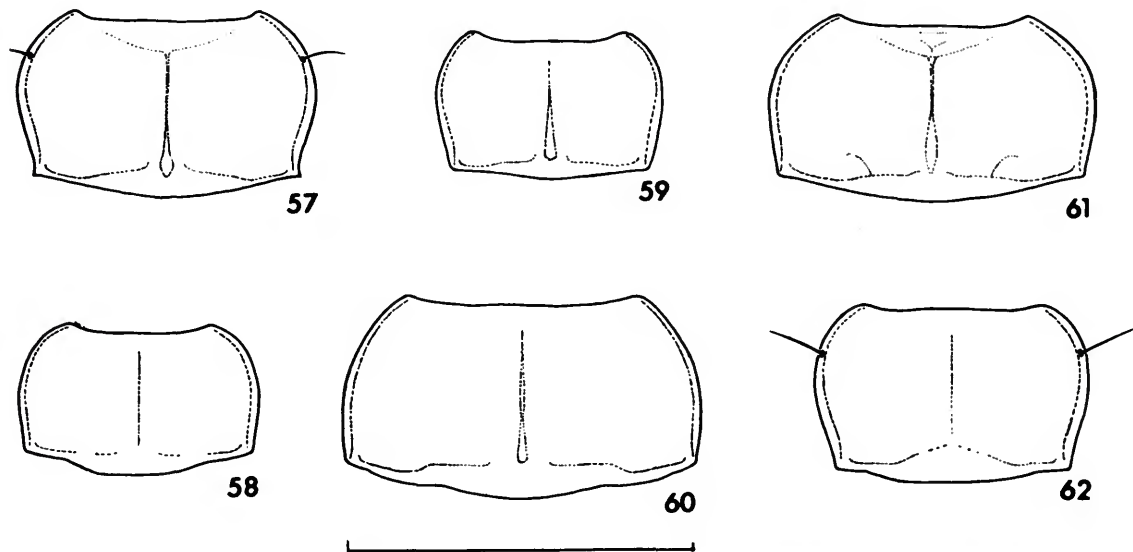
*Pronotum* (Figure 59): Transverse (W/L,  $\bar{x}$  1.74; range, 1.70–1.85, 4 specimens); subcordate with sides basally convergent; hind angles sharp, about 90°, sides anterior to angles slightly sinuate; lateral setigerous pores and laterobasal carinae absent; side margins beaded, not reflexed.

*Elytra*: Smooth; as in *X. laevis* except more prolonged apically.

*Microsculpture*: Dorsal surface of head, pronotum, and elytra with transversely stretched meshes.

*Secondary sexual characters*: Male genitalia (Figure 64) and female genitalia characteristic of the species group.

*Size*: Four specimens: length, 1.9–2.1 mm; width, 1.0–1.1 mm.



FIGURES 57–62.—Pronotum, dorsal aspect: 57, *Xystosomus laevis*, female, Nova Teutonia, Brazil; 58, *X. paralaevis*, female, São Paulo, Brazil; 59, *X. laevimicans*, female, Santos, Brazil; 60, *X. niger*, female, Serra Bocaina, Brazil; 61, *X. tholus*, male, Alto da Serra, Brazil; 62, *X. turgidus*, female, Rio Caraguata, Brazil.

NATURAL HISTORY.—Unknown, except adults collected in March. No teneral specimens seen.

LOCALITY RECORDS (Figure 72).—I have seen four specimens from the following localities:

SOUTH AMERICA: BRAZIL: Alto da Serra, São Paulo (BMNH); Santos (BMNH, USNM).

### 29. *Xystosomus impressifrons*, new species

FIGURES 56, 65, 68, 72

TYPE-LOCALITY.—Nova Friburgo, Rio de Janeiro Province, Brazil.

TYPE-SPECIMENS.—The holotype male and allotype are in MHNP. Both were collected by P. Germain in 1884. Thirty-one paratypes: MHNP, 18; JNeg, 3; USNM, 10.

DESCRIPTION.—*Form* (Figure 56): Short and broad with highly convex elytra, moderately broad, short pronotum, and narrow head. Easily distinguished by the presence of two pairs of lateral setigerous pores on the pronotum.

*Color*: Head and forebody rufopiceous; elytra usually more rufous; pronotum and elytra slightly iridescent; appendages testaceous or slightly infuscated, especially femora and distal antennal articles.

*Head*: Broad between eyes; frontal furrows moderately impressed, frons between furrows either slightly convex or depressed transversely; eyes medium-sized, moderately prominent.

*Pronotum* (Figure 56): Transverse (W/L,  $\bar{x}$  1.65; range, 1.47–1.77; 33 specimens); lateral setigerous pores present at apical third and at hind angles; laterobasal carinae absent; hind angles obtuse, sides anterior to angles evenly arcuate; side margins beaded, not reflexed.

*Elytra*: Smooth; as in *X. laevis*.

*Microsculpture*: As in *X. laevimicans*, except head with more evenly isodiametric meshes.

*Secondary sexual characters*: Male genitalia (Figure 65) and female genitalia (Figure 68) characteristic of the species group.

*Size*: Thirty-three specimens: length, 2.1–2.9 mm; width, 1.2–1.5 mm.

NATURAL HISTORY.—Unknown, except adults collected in February, April, May, August, and September. I have seen teneral specimens collected in all these months.

VARIATION.—Brazilian specimens from Rio Parahyba and Lagoa de Saquarema, and some from

Haut Macahe, have the frons transversely depressed posterior to the frontoclypeal line. Specimens from Nova Friburgo, Brazil, and others from Haut Macahe have the frons convex (i.e., normal for the species group).

LOCALITY RECORDS (Figure 72).—I have seen 33 specimens from the following localities:

SOUTH AMERICA: BRAZIL: Rio de Janeiro Province: Haut Macahe; Lagoa de Saquarema; Nova Friburgo. Rio de Janeiro (Province?): "Rive gauche du Parahyba."

### 30. *Xystosomus niger*, new species

FIGURES 60, 67, 72

TYPE-LOCALITY.—Serra da Bocaina, at 1,650 meters, São Jose Barreiro, Brazil.

TYPE-SPECIMENS.—The holotype male and allotype are in MHNP. Both were collected by M. Arvarenga in 1969. Three paratypes, from the type-locality: JNeg, 2; USNM, 1.

DESCRIPTION.—*Form*: Very broad and convex with small head and very broad pronotum. Easily distinguished from all other species of the group by the black integument or the swollen areas of the frons anterior to eyes and laterad of the frontal furrows.

*Color*: Head and body black; pronotum and elytra moderately iridescent; appendages testaceous or infuscated in part.

*Head*: Broad between eyes; frontal furrows shallow, laterally deflected almost at right angle to edge of eye; frons anterior to eye swollen; eyes medium-sized, large-faceted, slightly prominent.

*Pronotum* (Figure 60): Very broadly transverse (W/L,  $\bar{x}$  1.81; range 1.79–1.88; 5 specimens); lateral setigerous pores absent; laterobasal carinae short, thick, low, and interrupting basal groove; hind angles obtuse, sides anterior to angles evenly arcuate; side margins beaded, not reflexed.

*Elytra*: Smooth; as in *X. laevis*.

*Microsculpture*: As in *X. laevimicans*.

*Secondary sexual characters*: Male genitalia (Figure 67) and female genitalia characteristic of the species group.

*Size*: Five specimens: length, 2.5–2.7 mm; width, 1.36–1.44 mm.

NATURAL HISTORY.—Unknown, except all specimens collected in January. No teneral specimens seen.



FIGURES 63-68.—Genitalia. 63-67, Male, left lateral aspect: 63, *Xystosomus laevis*, Nova Teutonia, Brazil; 64, *X. laevimicans*, Alto da Serra, Brazil; 65, *X. impressifrons*, Brazil; 66, *X. tholus*, Alto da Serra, Brazil; 67, *X. niger*, Serra Bocaina, Brazil. 68, Female, *X. impressifrons*, "Lagune de Sacuaresma," Brazil: a, bursa copulatrix; b, spermathecal reservoir.

LOCALITY RECORDS (Figure 72).—I have seen five specimens from the following locality:

SOUTH AMERICA: BRAZIL; São Jose Barreiro, Serra da Bocaina (JNeg, USNM).

### 31. *Xystosomus tholus*, new species

FIGURES 61, 66, 72

TYPE-LOCALITY.—Alto da Serra, São Paulo, Brazil.

TYPE-SPECIMENS.—The holotype male and allotype are in BMNH. Both were collected by G. E. Bryant in 1912.

DESCRIPTION.—*Form*: Very broad and convex, more so than any other species in group, similar in this respect to *X. convexus* of the inflatus group. Easily distinguished by the lack of lateral setigerous pores on the pronotum, obtuse hind angles of the pronotum, and straight frontal furrows.

*Color*: Head and body piceous; pronotum and elytra moderately iridescent; appendages testaceous.

*Head*: Broad between eyes; frontal furrows moderately impressed, straight, posteriorly divergent; eyes medium-sized, moderately prominent.

*Pronotum* (Figure 61): Very broadly transverse (W/L,  $\bar{x}$  1.87; range 1.85–1.89, 2 specimens); lateral setigerous pores absent; laterobasal carinae absent; hind angles obtuse, sides anterior to angles evenly

arcuate; side margins beaded, not reflexed except slightly near base.

*Elytra*: Smooth; as in *X. laevis*.

*Microsculpture*: As in *X. laevimicans*.

*Secondary sexual characters*: Male genitalia (Figure 66) and female genitalia characteristic of the species group.

*Size*: Two specimens: length, 2.48–2.54 mm; width, 1.26–1.34 mm.

NATURAL HISTORY.—Unknown, except adults collected in March. No teneral specimens seen.

LOCALITY RECORDS (Figure 72).—I have seen two specimens from the following locality:

SOUTH AMERICA: BRAZIL: Alto da Serra, São Paulo (BMNH).

### 32. *Xystosomus turgidus* (Schaum)

FIGURES 22d–e, 62, 72

*Tachys turgidus* Schaum 1863:89. [Type missing from the point; lost in mail during transport to J. Negre, December 1963, according to Hieke's note on pin in HUB. Neotype, female, here selected from MCZ material determined by Van Emden, who undoubtedly saw the type. Type-locality: Originally "Brasilia," according to Schaum and labels, but herewith restricted to Nova Teutonia, Santa Catarina, Brazil, from labels appearing on selected neotype.]

DESCRIPTION.—*Form*: As in *X. laevimicans*. Easily distinguished from all other species in the



FIGURE 69.—Approximate range of the *gruti* group.

group by the absence of lateral setigerous pores at the hind angles of the pronotum together with the obtuse hind angles of the pronotum.

**Color:** Head and forebody rufopiceous; elytra usually darker; pronotum and elytra moderately iridescent; appendages testaceous; antennae slightly infuscated apically.

**Head:** Broad between eyes; frontal furrows shallowly impressed, straight, posteriorly divergent; eyes small, large-faceted, slightly prominent.

**Pronotum** (Figure 62): Broadly transverse (W/L,  $\bar{x}$  1.75; range, 1.62–1.86; 18 specimens); anterior pair of lateral setigerous pores present at apical third, posterior pair absent; laterobasal carinae rudimentary; hind angles sharp, obtuse, sides anterior to angles more or less straight; side margins beaded, not reflexed.

**Elytra:** Smooth; seta Eo4 in position d rather than c; plica small, evident externally.

**Microsculpture:** As in Figure 22d,e.

**Secondary sexual characters:** Male unknown. Female genitalia characteristic of the species group.

**Size:** Eighteen specimens: length, 2.0–2.4 mm; width, 1.0–1.2 mm.

**NATURAL HISTORY.**—Unknown, except adults collected in December, January, and February. One teneral specimen collected in December. The Nova Teutonia specimens were collected at 300–500 meters elevation.

**LOCALITY RECORDS** (Figure 72).—I have seen 18 specimens from the following localities:

**SOUTH AMERICA: BRAZIL:** Mato Grosso Province: Caraguata (MCZ). Santa Catarina Province: Nova Teutonia (MCZ, USNM).

### Natural History

The available habitat data indicate that some species of *Xystosomus* are arboreal, or at least subarboreal (*gruti* group members, 7 of 32); some are possibly associated with water (one member of *gruti* group and one member of *elaphrinus* group, 2 of 32); and one (a member of the *microtretus* group) has been found in the soil or under bark. No data are available for members of the *laevis* and *parainsularis* groups.

Habits and habitats are known best for members of the *gruti* group. Five species have been recorded in association with wood (twigs, limbs, or bark) or with leaves. My wife and I have observed members of both *X. gruti* and *X. nigripalpis* running among wilted leaves and on twiglets of a fallen tree where there was little or no direct sunlight. Ball and I found one individual of *X. gruti* running on a fallen "buttress tree" after we disturbed a bracket fungus. This log was in the direct sunlight. My living colonies of these two species always are active in daylight, never at night; thus, it is probable that



FIGURE 70.—Approximate ranges of the *elaphrinus* group (crosshatched area) and the *microtretus* group (solid areas).

they and the other members of the *gruti* group are diurnal. Only one specimen has been recorded at light (therefore, probably in flight), but specimens in my living colonies have repeatedly attempted flight. Members of *Paratachys* spp. and *Perigona* sp. in colonies kept with the *Xystosomus* colonies also frequently try to fly.

No conclusions can be made in regard to periods of activity of the *elaphrinus* group, as only one specimen of *X. elaphrinus* has been recorded at light. Two specimens of *X. spangleri* were "probably" associated with pools of water in pastures (or possibly beneath cow manure in the pastures), according to P. J. Spangler and O. S. Flint (personal communications). The members of this group look very much like *Elaphrus* spp., and it is not difficult to imagine them in the same ecological role in the tropics where no species of *Elaphrus* occur. However, Nevermann recorded *X. elaphrinus* in the same habitats as members of the *gruti* group. Much more field work must be done to discover the true nature of the *elaphrinus* group.

Members of the *microtretus* group (*X. microtretus*) have been sifted from forest soil. The group's

members are characterized by small eyes, and the males have broadly dilated and asymmetrical anterior tarsal articles. The collecting records and these character states lead me to suggest that the *microtretus* group is subepigean. Species of this group probably occur in heavily shaded areas in deep litter and do not come to light. The leaf- and twig-running members of the *gruti* group do not have small eyes, nor do they have the bulky articles of the male tarsi found in members of the *microtretus* group. The large eyes of the *gruti* group might be required to see diurnal predators (birds, lizards, and spiders and other insects) and, in fact, are common to many diurnal carabid beetles (Cicindelini, Elaphrini, Notiophilini, Anthiini, Graphopterini, and all diurnal bark-, leaf-, and twig-running groups I know). The bulky asymmetrical tarsal articles are very common in terrestrial forms, but not in arboreal groups. Larger arboreal carabids either have symmetrical padded tarsi (leaf runners) or long, narrow articles (bark-twig runners); many have pectinate claws, although members of *Xystosomus* do not.

The data available for determining annual

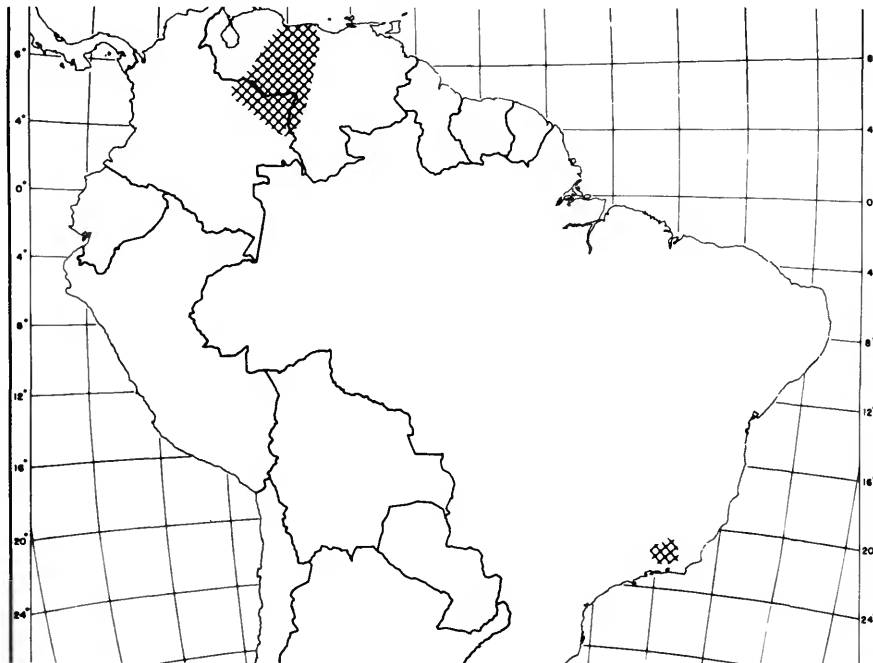


FIGURE 71.—Approximate ranges of the *parainsularius* group (crosshatched areas).



periods of activity are very scanty. Most specimens used for this study are old, and most 18th- and 19th-century carabid collectors did not make exact date labels. However, enough data are available for me to make some general comments. Adults are present in the fauna throughout the year. General adult records indicate March and September as possible months of larval or pupal presence, but this possibility is weakly supported and is noted here as simply a "place to start" in immature studies. The known data are given for each species to stimulate interest in obtaining immature records.

I have observed only two species of this genus alive; hence, only tentative comments on behavior can be made now. Extreme aggressiveness occurs in both *X. gruti* and *X. nigripalpis*. When two individuals come within "setal range" (the elytral setae—Eo series—are very long), both will attack each other head to head, apparently chewing off antennae (many specimens in my living colonies exhibit this loss). These traits are observed under caged conditions, of course, but the same aggressive behavior occurs among other diurnal carabids (e.g., *Cicindela* spp.) in the field.

Additional aspects of behavior and natural history will be published separately as studies progress.

#### Evolutionary Considerations

In addition to the general hypothetical comments below, another paper will discuss in detail an analysis of the phylogeny of Tachyina based on Hennig's (1966) principles. The details and evidence of the phylogeny of *Xystosomus* will be presented there in relation to other tachyine groups.

Six apparent lines of evolution occur in the external and genitalic forms of extant *Xystosomus* species.

The *gruti* group is composed of *Bembidion*-like beetles with arboreal habits. These species are the most generalized of the genus and have characteristics found in *Bembidion* (metallic color, brush-sclerite of the male genitalia, overall habitus, etc.) but not elsewhere in the Tachyina. With the Tachyina, the group shares other characteristics (complete sutural stria, recurrent groove on the elytral apex, biperforate procoxal cavities, etc.) not found in *Bembidion* or its close allies. Because of these



FIGURE 72.—Approximate range of the *inflatus* and *laevis* groups.

distributions of characteristics and others (e.g., truncate anterior tibial apex), the group should be regarded as primitive Tachyina which diverged from the main line of Tachyina evolution shortly after *Bembidiina* and Tachyina diverged. Since that time, five lines have emerged from the generalized *gruti* group stock to take separate, but similar or slightly different, evolutionary pathways.

The *elaphrinus* group is closely related to the *gruti* group, differing only in minor details of genitalic form, width of pronotum, and eye size. All species of the group are fully winged, and the total geographical range is nearly as large as that of the *gruti* group. It is probable that this group is a rather recent off-shoot of the *gruti* group as compared with the following groups.

The *laevis* group apparently has been separate from the *gruti* group for a long time. Flight has been lost by the *laevis* group, and it is probable that extant species have evolved from wingless-flightless ancestors. With no fossil records it is impossible to determine the age of the group, but reduction of sclerites, muscles, total loss of wing membranes, and partial fusion of elytra must have required a great deal of time in lowland tropical situations (see also Darlington, 1971:246). The restricted total range of the *laevis* group (Figure 72) is indicative of its immobility or, alternatively, of its restriction or withdrawal and of its specialization. No habitat data are available, but similar habitus forms such as *Tachymenis insularis*, *Tachymenis* spp., *Elaphropus halipoides*, *Elaphropus caraboides*, and *Tachys trunci* are arboreal, usually are found on leaves, in "spanish moss" (*Tillanzia* sp.), or beneath bark, and it is probable that members of the *laevis* group are also arboreal, or, at least, subarboreal, but not necessarily "runners" as described above.

The *inflatus* and *parainsularis* groups fall between the two above lineages in body form as "missing link" groups, but this position is apparent rather than real. Members of both these groups are wingless and flightless, having some or all of the muscle and sclerite reduction found in the *laevis* group. The *inflatus* group (*X. inflatus*) has strongly developed laterobasal carinae on the pronotum similar in structure to those of members of the *gruti* group or weakly developed carinae (*X. convexus*) that are still larger than any of the *laevis*

group. However, the male genitalia are quite similar to those of the *laevis* group. In this case, the complex structure of the male genitalia, especially the internal sac of the median lobe, must be weighted more than the character states of carinae. The latter form a morphocline and either are a result of convergence with members of the *gruti* group or, more likely, an indication that members of the *inflatus* group are retaining a *gruti* group characteristic while the *laevis* group has lost it. Both the *laevis* and *inflatus* groups probably were derived from the *gruti* group long ago, subsequently diverged from each other, and since have become independently wingless endemics with a small amount of "postflight" speciation.

The *parainsularis* group has not undergone post-flight reduction of flight components to the extent that members of the *inflatus* group or *laevis* group have, and in this respect it probably is convergent to these groups. Its much broader range (Colombia to Brazil), rather than restriction to a small area in southern Brazil, supports this conclusion. Externally, the group's two members are diverse in habitus, but the male genitalia are characteristically of the same type and much closer to the *gruti* group type than to the *laevis* group type. This, together with the well-developed pronotal carinae of both species and the general body form of *X. bisulcifrons*, indicate to me that this group is another independent off-shoot of the *gruti* group. The remarkable convergence in body form between *X. parainsularis* and *Tachymenis insularis* of the West Indies is of special interest.

The *microtretus* group is less well known than the above-named groups due to the paucity of available material; however, some hypotheses can be made. Morphologically, it appears to me that two possibilities exist: either the group is an off-shoot of the *gruti* group that has become subsequently adapted to the subepigeal environment, or it is an early derivative of the proto-*Xystosomus* stock, retaining *Bembidion* characteristics different from those retained by the *gruti* group. The male copulatory organ of *X. microtretus* does not help clarify the matter at all. Its general structure is similar to the male copulatory organ of certain species groups of *Paratachys*, a very remotely related group of derivative Tachyina. These similarities must be considered convergence. Because of the amount and

nature of differences between this group and other *Xystosomus* groups, it is possible that this group should be regarded as a distinct genus or subgenus forming a sister group to *Xystosomus*. However, because of the small amount of material available for study I do not think it is justifiable to erect a new name at this time.

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