The genus ZoniopodaStål 1873 (Acridoidea, Romaleidae, Romaleinae)

Author: Carbonell, Carlos S.

Source: Journal of Orthoptera Research, 16(1) : 1-33

Published By: Orthopterists' Society

URL: https://doi.org/10.1665/1082-6467(2007)16[1:TGZSAR]2.0.CO;2

The genus *Zoniopoda* Stål 1873 (Acridoidea, Romaleidae, Romaleinae)

Accepted January 1, 2007

CARLOS S. CARBONELL

Facultad de Ciencias, Universidad de la República, Uruguay. Casilla de Correo 490, 11000 Montevideo, Uruguay.
E-mail: cscarbo@montevideo.com.uy

Contents

Abstract

A revision of the genus *Zoniopoda* is made on the basis of the material of several museums and also on that collected by the author. The genus as known at present is a rather small one, with nine valid species described from 1831 to the present, and an additional species described here. Among the names in the literature for species of this genus, three are here considered to be junior synonyms. This generic name has also been used for three species now placed in other genera. Species in this genus are of medium size, and fairly similar in form. They are divided in this text into two groups: the species in one of them have very distinctive colors and color-patterns, while those in the other are all rather uniformly colored green, and can be told apart only by some rather slight differences.

All known species of this genus live in the southern part of South America, east of the Andes. Among the romaleine genera, *Zoniopoda* seems most closely related to *Chariacris* Walker 1870 and *Diponthus* Stål 1860, from which, however, it can be readily separated by some evident characters. All the species of the genus are illustrated, both in habitus and in some taxonomically important details.

Key words

genitalia, geographical distribution, measurements, new species, redescriptions, *Zoniopoda*, South America, romaleine

Introduction

Among the many species originally described in the genus *Acridium*, Stål (1873: 51) chose *A. tarsatum* of Audinet-Serville as the first species on which to base his new genus *Zoniopoda*, including in it also his new species *Z. emarginata* (later found to be the same described by Blanchard in 1843 as *Acridium omnicolor*). The group seems to be a rather small one, with some of its species common and widespread and others rare or narrowly localized geographically. Between 1831 and 1911, twelve nominal species were described, of which three happen to be synonyms. And from 1911 to the present, no other species was assigned to the genus. By examining numerous specimens in the collections of different museums and by collecting in most of the area of its distribution, I have been able to clarify the taxonomy of this genus, and to find one undescribed species.

Materials and methods

Specimens used for this work have been borrowed from different museums (see list of repositories in Appendix I) or collected by the author.

Methods are in general the ones normally used in taxonomic studies. Male genitalia were dissected and cleaned after treating them with a KOH solution at room temperature, stained when necessary with mercurochrome. Drawings of the whole insects were made using a photograph as a basis, over which a plastic drawing film was placed and the drawing made upon it with India ink. For drawings of anatomical details, such as male genitalia or some body parts, an ocular reticule and squared paper were used. Measurements were taken by means of a sliding stage whose displacement is registered by an attached dial caliper. Accuracy of these measurements is in the range of 1/10 of a millimeter. Fig. 22 shows the measurements taken for each of the species.

Colors are named in the descriptions according to the tables and nomenclature in Smithe (1975). The numbers within parentheses that follow the color names refer to those in Smithe's tables. These colors are given as a general indication, since colors in specimens vary within a certain degree in the living insects, and they also change or fade for specimens in collections, according to their preparation (evisceration, drying, etc.) and the conditions of their subsequent preservation.

Nomenclature of wing veins is according to Ragge (1955), Uvarov (1966). Distribution maps were made by measuring, on the best maps available, the coordinates of the localities of collection given on the specimens' labels. Hence these coordinates, such as recorded in Appendix I, are only approximate.

A number of specimens of each species have been studied in the course of this work. Those of the type series were studied in the corresponding museums. Others, in the MONTEVIDEO collections or elsewhere, have been used for the descriptions, *etc*. When mentioning the specimens examined, only the localities and dates of collection are registered: to record also names of collectors and other data would unduly lengthen this text, without adding much useful information.

Collective names

Zoniopodae Brunner von Wattenwyl 1893:134.
Giglio-Tos 1898:42. (Including *Zoniopoda*, *Clarazella*, *Anaua*).
Uvarov and Dirsh 1961:157.
(*Clarazella* is now in Ommexechidae, *Anaua* is a junior synonym of *Chariacris*).
Zoniopodini; Rehn and Grant 1959:258 (Including only *Zoniopoda*).

Alphabetical index to species names

Valid names in boldface, others are junior synonyms. Generic names in parentheses are those in original descriptions if different from *Zoniopoda*.

collaris Bruner 1911 (= *exilipes*)
cruentata (Blanchard 1843) (*Acridium*) (= *tarsata*)
emarginata Stål 1873 (= *omnicolor*)
exilipes Bruner 1906
fissicauda Bruner 1906
hempeli Bruner 1911
iheringi Pictet and Saussure 1887
juncorum Berg 1887
mimicula Rehn 1909
omnicolor (Blanchard 1843) (*Acridium*)
***danottei* n. sp.**
similis Bruner 1906
tarsata (Serville 1831) (*Acridium*)

Species described in the genus *Zoniopoda* but not belonging in it:
Zoniopoda basalis Bruner 1913 (*Chariacris*)
Zoniopoda picta Bolivar 1884 (*Diponthus*)
Zoniopoda robusta Bruner 1911 (*Xestotrachelus*)

Genus *Zoniopoda* Stål 1873

Fig. 1.

Typus generis: Acridium tarsatum Serville 1831

Etymology.— From (Greek) *zone* = belt, girdle, and *podo*, *-poda* = foot; apparently an allusion to the black-banded legs of the species (*Acridium tarsatum* and *Zoniopoda emarginata*) on which Stål based this genus.

Geographical distribution.— (Figs 20, 21) As known at present, the species of *Zoniopoda* are found in South America east of the Andes, between parallels 15 and 36 South.

Habitat.— There is no general habitat of all the species of *Zoniopoda*. The little that has been recorded on the subject indicates that different species live in different types of habitats. Grasslands have been indicated for some species; others seem to prefer low, humid places with tall herbaceous plants or arbustive vegetation. *Z. juncorum*, has been found in Uruguay and Argentina, perching on rushes growing in places covered by shallow water. What is known on this subject has been recorded below, under each of the species.

Food-plants, economic importance.— The few records of the plants eaten by these insects indicate that they can feed on plants of the families Gramineae (grasses), Leguminosae (alfalfa and others), Oleaceae (olive trees in nurseries) and Solanaceae (tobacco). They are apparently polyphagous, eating plants of a variety of families. Gangwere and Ronderos (1975:178) classify *Z. iheringi*, *Z. omnicolor* and *Z. tarsata* as unselectively polyphagous, with mandibles of the forbivorous type; their feces contained pieces of leaves of dicots. Economic importance of most species is minor or null, but there are a few recorded instances when populations of some of them increased and became locally destructive to crops.

Caryology.— Data on the caryology of species of *Zoniopoda* are summarized in Mesa *et al*. (1982). Most species studied (*Z. hempeli*, *Z. juncorum*, *Z. omnicolor*, *Z. similis*, *Z.tarsata* and two unidentified species) have a caryotype of 23 XO (males) and 24 XX (females). That of *Zoniopoda iheringi*, however, is 22 XY in the male and 22 XX in the female. Cardoso and Di Tomasi (1979) studied chromosomal structure and heterochromatic regions in *Z. tarsata*.

Taxonomy.— The general aspect of the species of the genus can be seen in the illustrations of this work. Individuals of the species in this genus are medium-sized; males range from 30 to 45 mm, females from 40 to 60 mm.

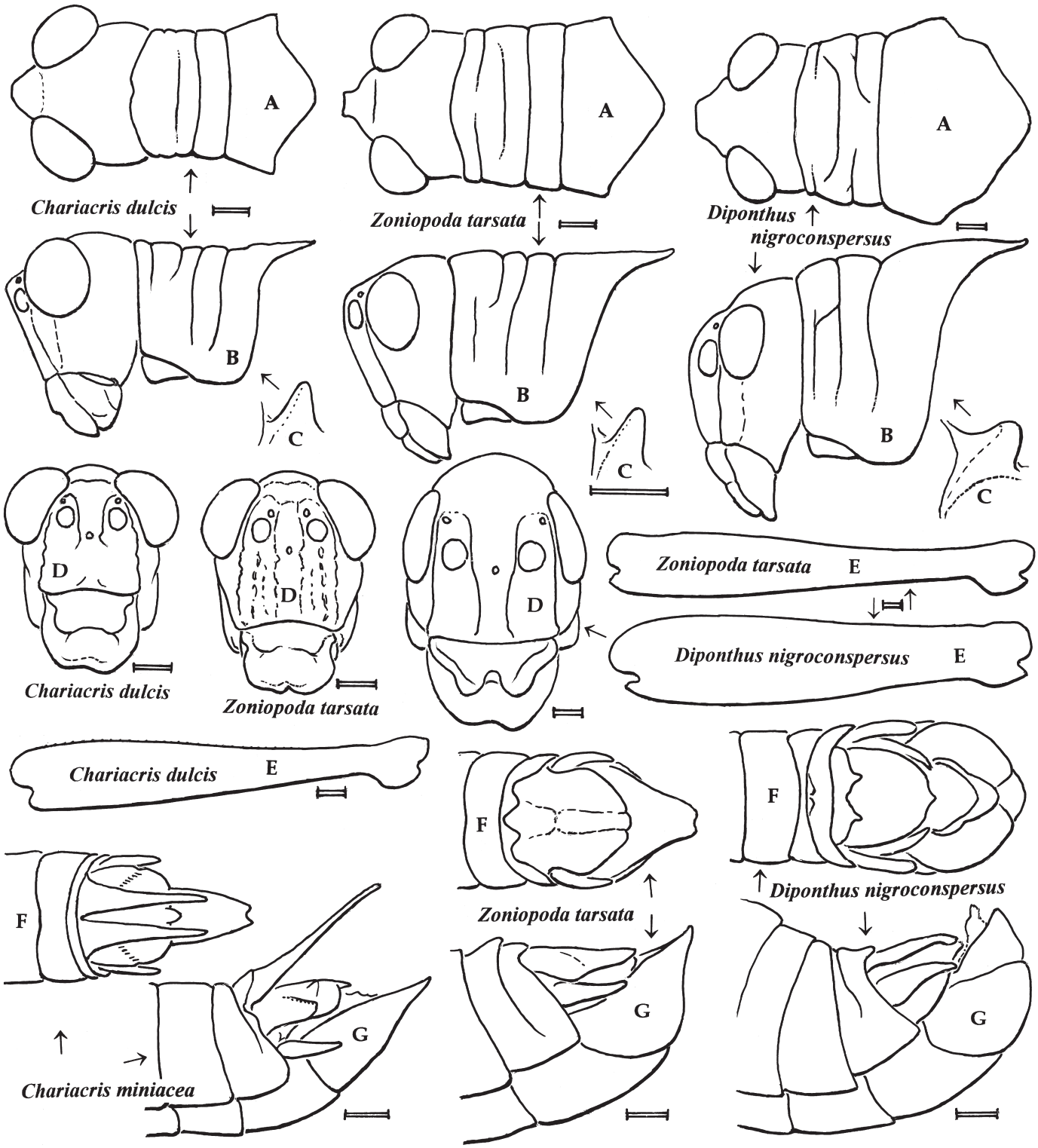

Fig. 1. Genera *Zoniopoda* Stål 1873, *Chariacris* Walker 1870 and *Diponthus* Stål 1860, species as indicated. **A**. Head and pronotum, dorsal. **B**. Same, lateral. **C**. Prosternal tubercle. **D**. Head, frontal. **E**. Hind femur. **F**. End of male abdomen, dorsal. **G**. Same, lateral. *Chariacris dulcis* from Brasil, Mato Grosso, Sinop. *Zoniopoda tarsata* from Uruguay, Dept. Rivera. *Diponthus nigroconspersus* from Uruguay, Dept. Tacuarembó.

Separation of species is easy in the group TARSATA, (see below) where colors and color patterns are very distinctive for each of them. By observing the figures and reading the description of colors, accurate identifications may be made. Species in the group IHERINGI, which are all yellowish-green and with few specific characters, are more difficult to identify. In these species, however, there are some details such as the profile of the pronotum, the shape and colors of the epiproct and cerci of the males, the shape of the epiphallus, the colors of parts of the legs and other characters mentioned in the corresponding descriptions, that allow correct identifications.

Examination of the phallic complex, useful in other groups for the identification of the species, is in this genus of little use. It is rather uniform in all the species; its most useful character for taxonomic purposes being the shape of the epiphallus, but even this character is fairly variable within the species.

Generic characters.— Integument rugose in most species, smooth on parts of head, legs and abdomen, in some species also on parts of pronotum. Antennae filiform, markedly longer than head and pronotum together. Head hypognathous. Fastigium of head limited caudad by transverse furrow on interocular space. Pronotum: pro- and metazona subequal in length; either may be somewhat longer or shorter; pronotal front edge slightly projected over occiput, the caudal one extending in an obtuse angle over base of tegmina; mid-dorsal carina varying from well-marked, ridge-like and denticulate, to smooth and almost obsolete in different species, always cut by three transverse sulci. Lateral carinae marked only on metazona, where they are rather rounded and somewhat indistinct. Prosternal tubercle spiniform, straight, acutely pointed. All known species long-winged. Stridulatory structures are of the romaleid or tegmino-alar type; the denticulate cross-veins on hind wings rather weak as compared with those of other romaleines. Ovipositor of soil-laying type. Male abdominal terminalia as figured for each species; shape and position of furculae and shape of epiproct and cerci of taxonomic value. Phallic complex typically romaleid, rather uniform throughout the genus.

Affinities.— The romaleine genera most closely related to *Zoniopoda* seem to be *Chariacris* Walker 1870 and *Diponthus* Stål 1860. Both differ from *Zoniopoda* in some important characters (see Fig. 1). In *Chariacris*, the furculae of the tenth segment in males are very long, far surpassing the posterior margin of the epiproct and with very acute tips, which permits easy separation from *Zoniopoda*. Also in *Chariacris* the frontal carina is absent below the median ocellus (it reaches the epistomal suture in *Zoniopoda*), and *chariacris* species have, at the base of the tegmina, conspicuous spots (a band in one species) of a color contrasting with that of the rest of the tegmen, white, yellow or orange according to the species (these spots not present in *Zoniopoda)*. Hind femora in *Chariacis* have dorsal carinae minutely serrulated, while these are smooth in *Zoniopoda*.

Differences with *Diponthus* are also evident. Antennae in *Zoniopoda* are considerably longer than head+pronotum, while in *Diponthus* they are either shorter or only slightly longer. Shape of the head is very different in *Diponthus*, where the union frons–fastigium in lateral view is quite rounded, while it is angulated in *Zoniopoda*. Hind femora are, in all species of *Diponthus*, much wider and more robust than in *Zoniopoda*. And a difference that has frequently been used to separate these genera is the shape of the prosternal tubercle: conical, straight and spiniform in *Zoniopoda*, in *Diponthus* compressed and retrorse.

Chromacris Walker 1870 may be also related to *Zoniopoda*, but its pronotum has a very different shape, and its hind wings have a characteristic color pattern (Roberts & Carbonell 1982).

Characters used for separation of species.— The most obvious one is the color-pattern for the species of the group Tarsata, but pattern is important too, though less evident, in the Iheringi group. Morphological characters lie mainly in the pronotum, especially in the relief and other characters of its dorsal median carina (height, denticulations, *etc*.) (Fig. 8), and in the male abdominal terminalia (furculae, epiproct and cerci). The phallic complex is fairly uniform within the genus, its most significant character being the shape of the epiphallus (Figs 3, 4), even if it is somewhat variable within each species. Color of hind wings, generally used in the old descriptions, lost importance when it was found it varies geographically (from red to blue) in some of the species.

Species Groups

The species of this genus can be grouped as follows:

TARSATA Species Group. Body and legs marked with black and other colors in characteristic patterns; dorsal carina of pronotum smooth in lateral view (Fig. 8). Comprises:

Zoniopoda tarsata (Serville 1831) (= *Acridium cruentatum* Blanchard 1843)
Zoniopoda omnicolor (Blanchard 1845) (= *Zoniopoda emarginata* Stål 1873)
Zoniopoda exilipes Bruner 1906 (= *Zoniopoda collaris* Bruner 1911)
Zoniopoda fissicauda Bruner 1906
Zoniopoda danottei n. sp.

IHERINGI Species Group. Body uniformly green. Legs green; tarsi and hind tibiae, (sometimes also middle tibiae) may be red; dorsal carina of pronotum granulated or denticulate in lateral view (Fig. 8). Comprises:

Zoniopoda iheringi Pictet and Saussure 1887
Zoniopoda juncorum Berg, *in* Pictet and Saussure 1887
Zoniopoda similis Bruner 1906
Zoniopoda mimicula Rehn 1909
Zoniopda hempeli Bruner 1911

While the species of the group TARSATA are easily identifiable by their colors and color patterns, which are clearly different in each species, those of the IHERINGI group are more uniform in these characters, and differ from each other only in a few and rather inconspicuous details.

TARSATA species group

The species in this group are treated below in the order of their publication.

Zoniopoda tarsata (Serville 1831)
(= *Acridium cruentatum* Blanchard 1843)
Figs 1, 2, 3, 5, 6, 8, 9, 10 (habitus), 20

Etymology.— Specific name: from Greek *tarsos*, meaning (among other things) the part of the foot between toes and heel; refers indeed to the brightly colored tarsi of the individuals of this species, which are banded with red and black. Blanchard's name *cruentatum*, from Latin *cruentus*, meaning "stained with blood", may be due to the many

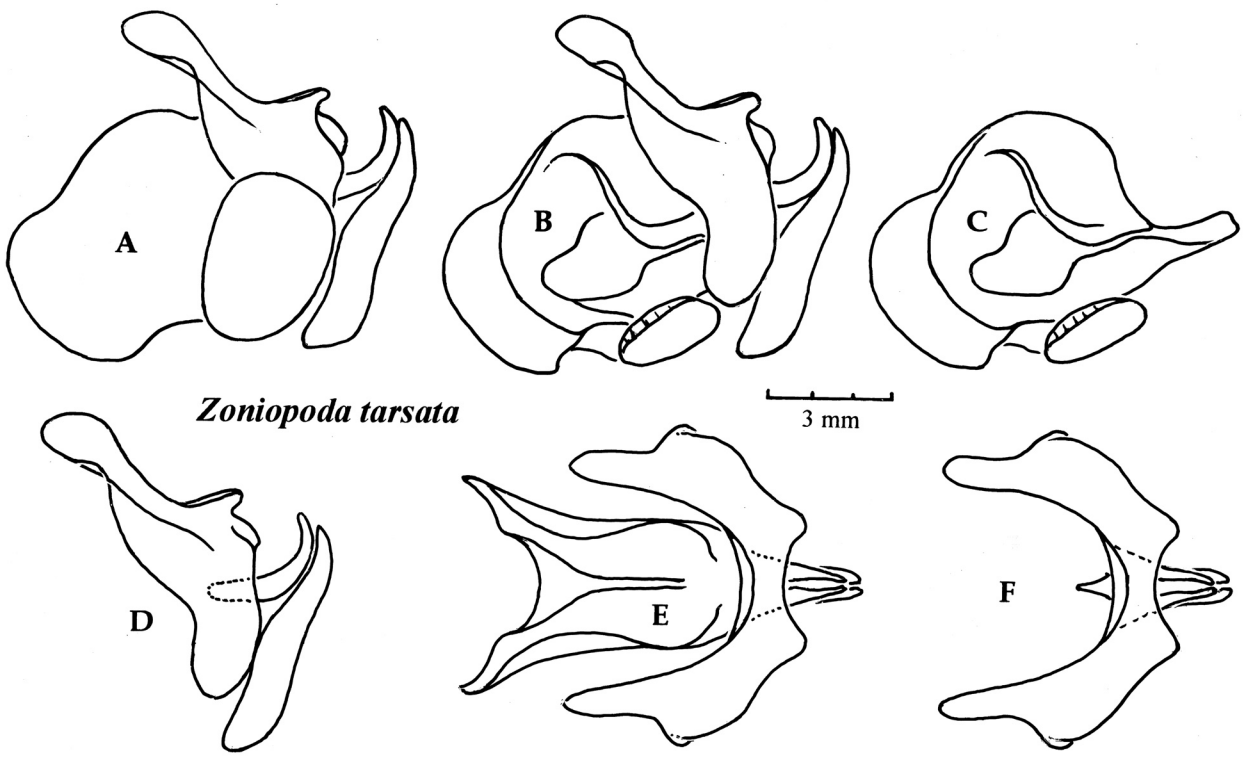

Fig. 2. *Zoniopoda tarsata*, phallic complex. **A**. Lateral view, without epiphallus. **B**. Same, without lateral plates. **C**. Endophallus without apical valves. **E**. Dorsal view without epiphallus. **F**. Cingulum and endophallic valves. Specimen from Uruguay, Dept. Artigas.

red markings on the head and legs of individuals of this species.

Size.— Males 37 to 38 mm, females 40 to 50 mm. See Table 10 for other measurements.

Identification.— (Fig. 10) Integument smooth on legs and abdomen. Rugose on head and thorax: the upper parts of these rugae are in general of a color different from that of the intervening surface. Mid-dorsal pronotal carina well marked but low, not ridge-like; transverse sulci deep on dorsum and sides. Pro- and metazona may be of equal length, or prozona may be shorter than metazona. Male abdominal terminalia as shown in Figs 5 and 7.

Chromatic characters.— General coloration of the pronotum and tegmina yellowish-green, varying in different specimens from olive-yellow (52) to lime-green (59). Legs banded with black, red (11) and yellow (56). Antennae black. Head: dorsal and lateral areas red (11); front partially yellow (56) on surface of rugae; fastigium and interocular area mostly black; clypeus, labrum and mandibles black; labial and maxillary palpi yellow, or yellow with black bands in different individuals. Pronotum and meso-metapleurae with green rugae (52, 59) on black background. Pronotum is in some specimens uniformly colored (as in Fig. 10), in others it has yellowish-green longitudinal bands where rugae and background are of the same color, alternating with bands that look darker by having green rugae on a black background. Light-colored bands in these specimens are: a narrow median one along dorsal carina; paired ones along lateral carinae, at middle of lateral lobes and along their lower margins. Meso-metapleurae as described for pronotum, sometimes uniform, sometimes with darker and lighter areas. Tegmina entirely yellow-green (52, 59) with veins of a slightly lighter hue. Hind wings hyaline, with a purplish-blue tint, between lilac (76) and lavender (77). Fore and middle legs: coxa-trochanter black sometimes with small red (11) or yellow (56) areas; femur black with wide red median band and (generally) small areas at base and apex red (11); tibia black with small red basal area and wide yellow (56) median band. Tarsi: first article red with black apex; second one black; third article with black basal half, red apical half, claws black, arolium red. Hind legs: coxa-trochanter black with small yellow areas; femur yellow (56) with two wide transverse bands and apex black, this apical black part with small red dorsal spot; tibia with red base, a small black transverse sub-basal band, then a wide black band, then a yellow band, the apical half black; tarsus as described for fore and middle legs. Individuals from the southern parts of the species' range are lighter-colored than those from the north. There is a north-south color gradient, with the northern specimens darker and with brighter reds and yellows, the southern ones paler, their colors less intense. There is also an east to west color gradient. Comparing specimens of *Z. tarsata* from the extreme northwestern part of its area (Salta, Argentina) with those of the Atlantic coast at the same latitude (Rio de Janeiro, Brazil), many small differences in the distribution and extent of colors on body and legs can be observed. However, none of these differences should lead to misidentifications, the other species in this group being clearly different.

Geographical distribution.— (Fig. 20) *Z. tarsata* is the most common, abundant and widespread species of the genus and as such, has been mentioned in numerous publications. This species inhabits the whole of the territory we have signaled for the genus, that is the part of South America east of the Andes, between parallels 15° and 36° South.

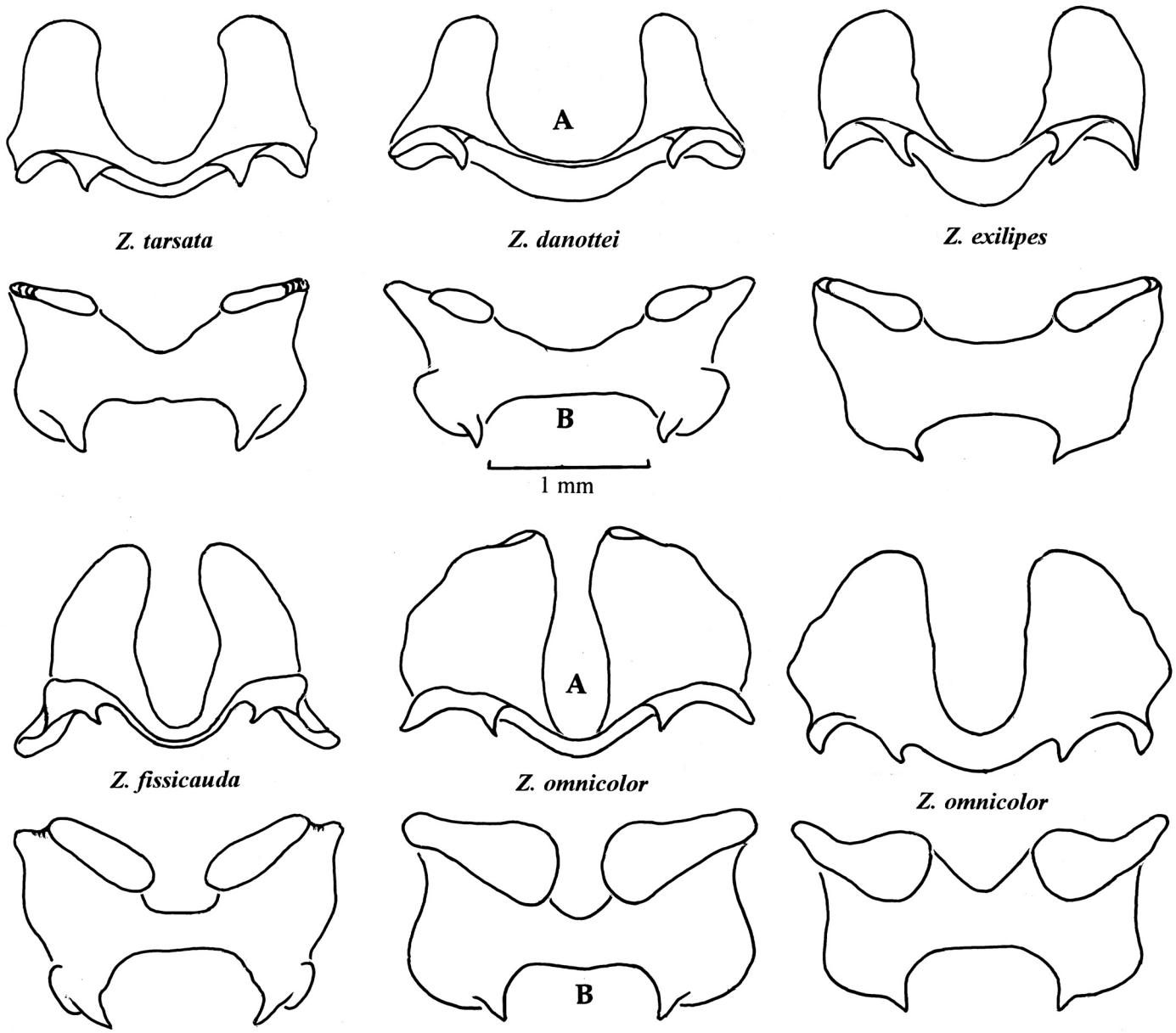

Fig. 3. Epiphalli of species of *Zoniopoda*: **A**. Frontal. **B**. Dorsal. *Z. tarsata* from Brasil, Minas Gerais, Serra do Caraça. *Z. danottei* from Brasil, Distrito Federal. *Z. exilipes* and *Z. omnicolor* (center and right) from Paraguay, Sapucay. *Z. fissicauda* from Brasil, Mato Grosso do Sul, north of Campo Grande.

Habitat, food plants, bionomics.—Most mentions in the bibliography just give data of this species' distribution, but some are of interest for adding knowledge of its habitat, food plants, bionomics, etc. Bruner (1900: 61) says that the species "occurs for the most part on low ground or in the vicinity of water where vegetation is rank. It has sometimes been reported in sufficient numbers to cause noticeable injury to vegetation." My own observations of the species in Uruguay, Argentina and Brazil confirm the previous statement of Bruner with regard to preferred habitat. In Uruguay, the insect is sometimes very abundant in low places with vegetation where tall plants (1 to 2 m) of the Compositae family are prevalent. The insects are found usually on these plants, but when collected and put in cages would not eat any of these plants but only grasses and leguminous plants. They probably leave the Compositae at some time in the day, or at night, to feed on the grasses and perhaps on other plants below. Collecting them in the daytime in bright sunlight is difficult because they readily fly, but at night they can be collected in numbers by hand. Gangwere and Ronderos (1975) classify this species as unselectively polyphagous with mandibles of the forbivorous type. A detailed report on the species is found in COPR 1982: 125, where a female specimen is figured. Several species of Compositae are mentioned as food plants, but from my own observations I believe that these plants, where the insects perch, may not be used as food.

Among crop plants attacked COPR mentions alfalfa, natural grasses, olive and tobacco— none of these plants belonging in the Compositae family. Liebermann (1948, 1949b) mentions concentrations of this insect on *Wedelia glauca* and *Ambrosia tenuifolia* (Compositae, Heliantheae) in Argentina. Bruner (1906) states that it is found on aquatic plants, a fact that I have been unable to confirm in the many situations where I have met with this insect. Barrera and

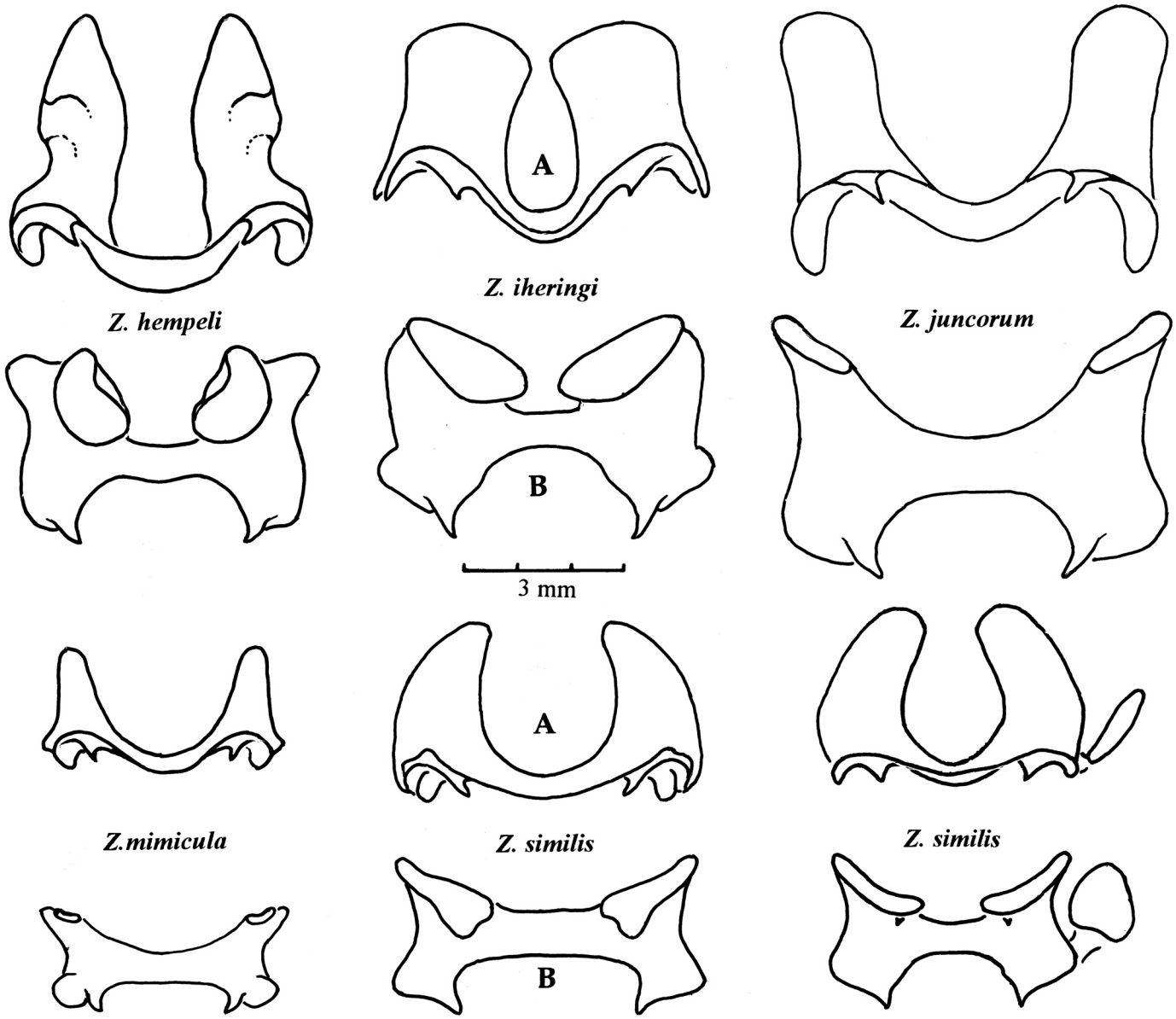

Fig. 4. Epiphalli of species of *Zoniopoda*: **A**. Frontal. **B**. Dorsal. *Z. hempeli* from Paraguay, Sapucay. *Z. iheringi* from Uruguay, Dept. Artigas. *Z. juncorum* from Uruguay, Dept. Florida. *Z. mimicula* from Brasil, Mato Grosso, Gaucho. *Z. similis* (center) from Uruguay, Dept. Rivera; (right) from Brasil, Rio Grande do Sul, Ronda Alta.

Paganini (1975) state that in Tucumán (Argentina) individuals of this species, together with other grasshoppers, are found in dense associations on tall graminaceous plants on which they feed, and that their egg pods contain up to 59 eggs. An egg pod of this species is shown in Fig. 9. Schiuma (1951) mentions *Baccharis articulata* (Compositae, Eupatorieae) as the food plant of this species but, as said above, these plants might serve as perching substrate and not as food.

The economic importance of *Z. tarsata* appears to be minor, its populations rarely increasing and becoming destructive to cultivated plants. Hepper (1945) mentions the weak stridulation individuals of this species produce, "by moving their hind legs against their tegmina". However, the presence of stridulatory crossveins on the hind wings and the strongly raised first vannal veins on the undersurface of the tegmina, point to stridulation produced by the tegmino-alar mechanism found in most romaleines.

Zoniopoda omnicolor (Blanchard 1845)
(= *Zoniopoda emarginata* Stål 1873)
Figs 3, 6, 8, 11 (habitus), 20

Etymology.— Specific name, from Latin *omnis* (= all) and *color;* literally, "of all colors", refers indeed to the bright colors of this insect. As to Stål's name *emarginata,* that may mean "without margin" or "notched at apex"; according to Brown (1956), it refers to the slight notch in the middle of the anterior pronotal margin of the female: "*pronoto apice leviter emarginato*" writes Stål in his description of this species.

Size. Males 32-36 mm, females 46-48 mm. Other measurements in Table 7.

Identification.— (Fig 11) Integument smooth, shiny on head, prono-

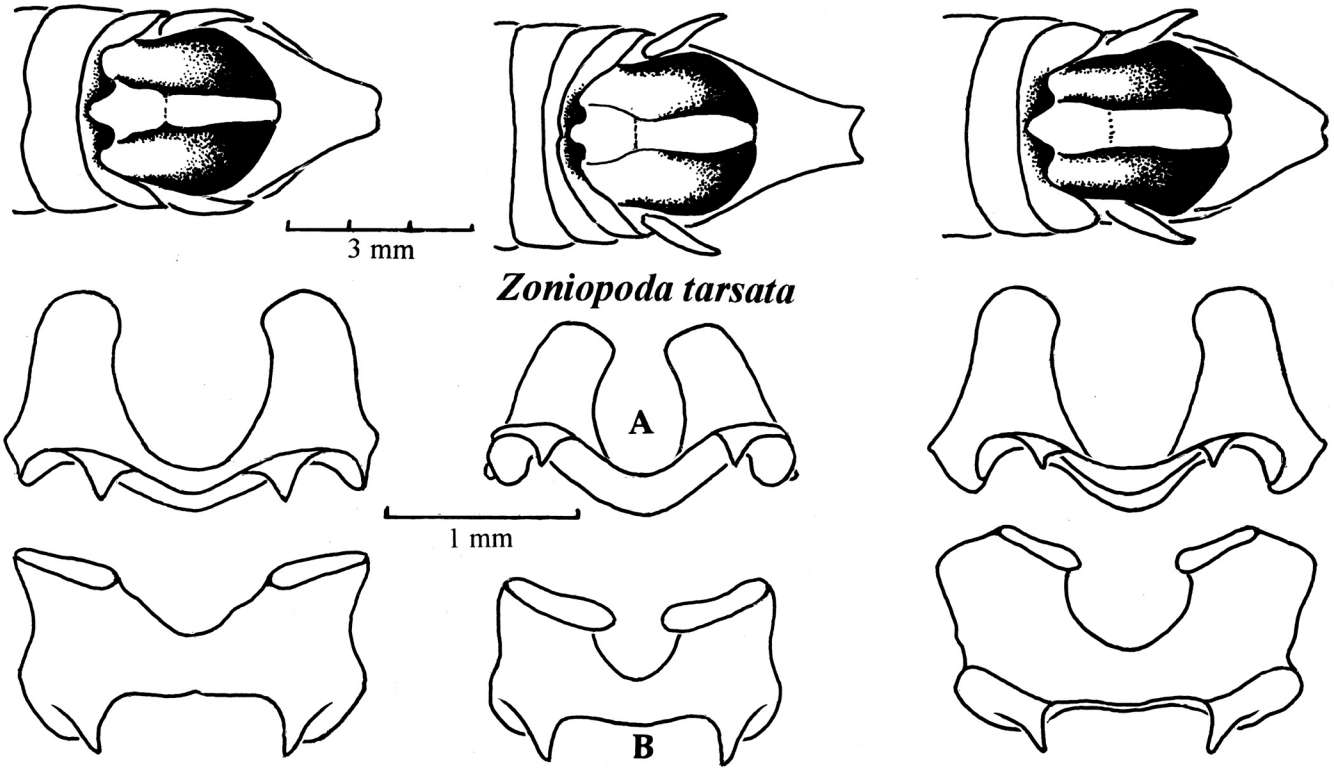

Fig. 5. *Zoniopoda tarsata*, variation of end of male abdomen and epiphallus. **A**. Frontal. **B**. Dorsal. Left column, specimen from Brasil, Minas Gerais, Serra do Caraça. Center column, specimen from Brasil, Rio de Janeiro. Right column, specimen from Uruguay, Dept. Artigas.

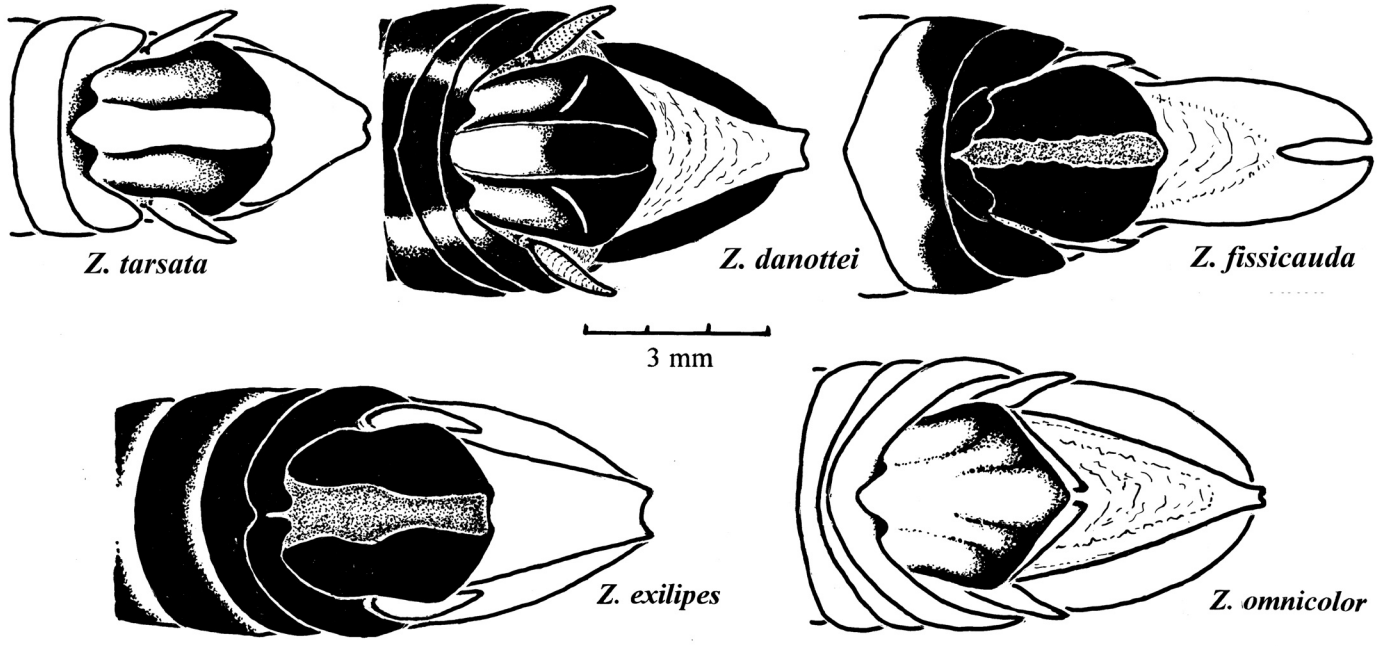

Fig. 6. *Zoniopoda*, end of male abdomen, species as indicated. *Z. tarsata* from Uruguay, Dept. Artigas. *Z. danottei* from Brasil, Distrito Federal. *Z. fissicauda* from Mato Grosso do Sul, north of Campo Grande. *Z. exilipes* and *Z. omnicolor* from Paraguay, Sapucay.

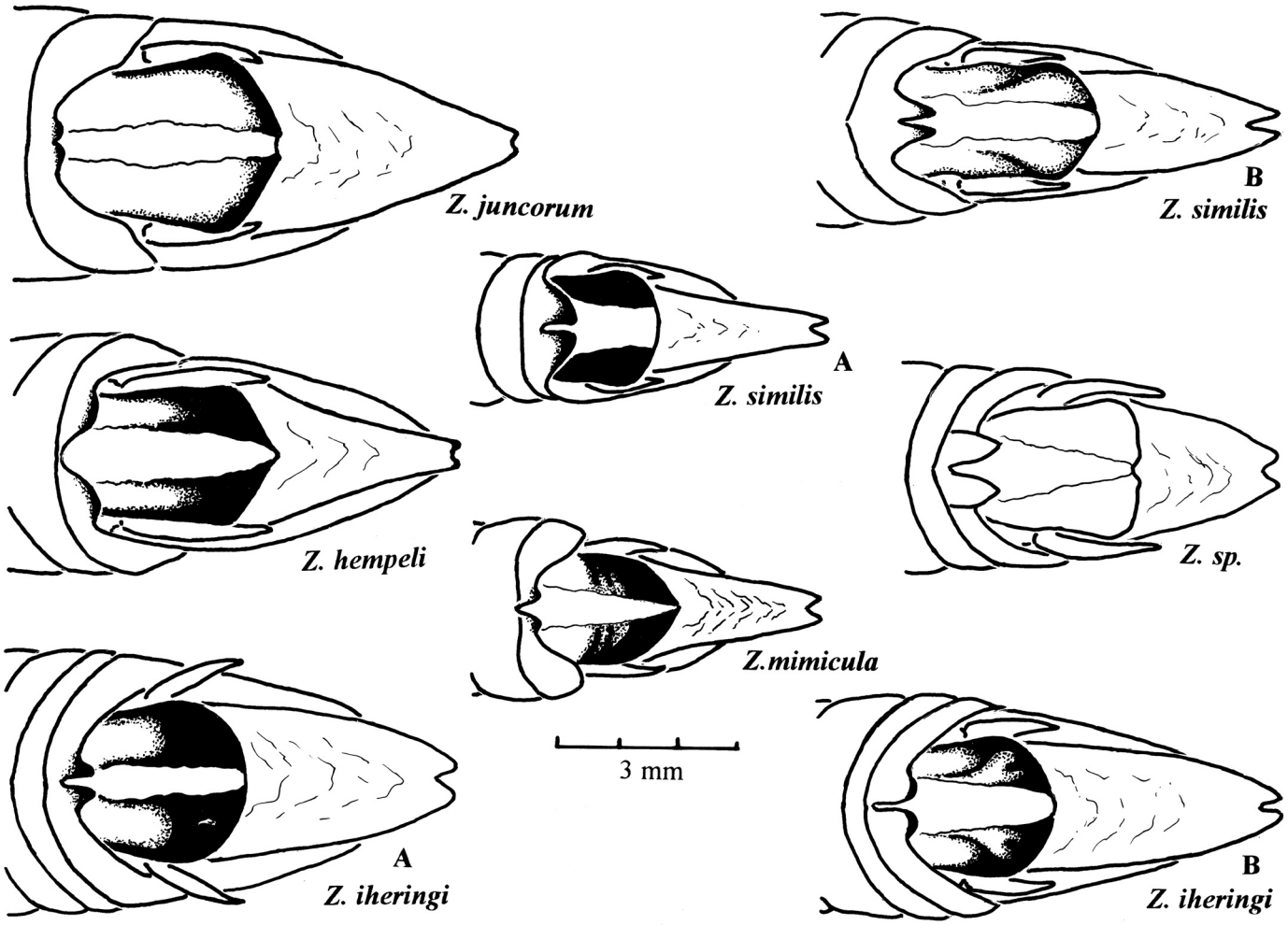

Fig. 7. *Zoniopoda*, end of male abdomen, species as indicated. *Z. juncorum* from Uruguay, Dept. Florida. *Z. similis*, **A** from Brasil, Rio Grande do Sul, Ronda Alta; **B** from Uruguay, Dept. Rivera. *Z. hempeli* from Paraguay, Paraguarí. *Z. mimicula* from Brasil, Mato Grosso, Gaucho. *Z. iheringi*, **A** from Brasil, Santa Catarina, Papanduva; **B** from Uruguay, Dept. Artigas. *Z.* sp., unidentified species from Paraguay, Caaguazú, near Ihú.

tum, abdomen, legs; somewhat rugose on meso-metapleurae; parts of prozona and most of metazona impressopunctate. Mid-dorsal carina of pronotum almost obsolete on prozona, very slightly marked on metazona; transverse sulci rather deep. In the specimens examined, pro- and metazona in males about equal in length, either of them might be slightly longer or shorter than the other; in females prozona always somewhat longer than metazona. Male abdominal terminalia as shown in Fig. 7.

Chromatic characters.— Antennae black. Head mostly red (11), black over lateral ocelli, behind eyes, on parts of genae and on clypeus, labrum, and mandibles; yellow (56) band below eyes and antennal sockets. Pronotum black with longitudinal yellow bands along median carina, on lateral carinae and on middle of lateral lobes; ivory-colored area runs along pronotal edges, narrow anteriorly, wide inferiorly and posteriorly. Meso-metapleurae black, with narrow yellow oblique band. Tegmina black, with yellow veins. Hind wings hyaline, very pale lavender (77). Abdominal tergites black with yellow posterior and inferior margins. Coxae-trochanters of all legs black; fore and middle legs: femora black with narrow basal band, wide median one and apical spot yellow; tibiae black, with middle yellow band; tarsi with 1st segment black with yellow middle band, 2nd segment black, 3rd segment with basal half yellow, apical half black; claws black, arolium brown. Hind legs: coxa black basally, yellow distally; femur mostly yellow, with a basal fragmented black transverse band, black middle band, black apical band with dorsal yellow spot; tibia mostly black, yellow basal spot, yellow sub-basal band (sometimes incomplete), wide yellow band at mid tibia; tarsi as described for fore and middle legs.

Geographical distribution.— (Fig. 20) Data from the bibliography and the specimens examined, indicate that this species is found from southern Mato Grosso in Brasil to La Pampa in Argentina, that is, between parallels 17 and 36 S. However, between these parallels I have seen no specimens from localities east of the Paraná River, except the type specimen, labeled "Corrientes". This is an old specimen that may have been sent to Paris from Corrientes, but might have been collected on the other side of the river, in the province of Chaco, where this species certainly exists. The species seems to be absent from a wide territory along the Atlantic coast that includes all the eastern Brazilian states from Rio de Janeiro and Minas Gerais to Rio Grande do Sul, the Argentine provinces of Misiones, Corrientes and Entre Rios and the whole of Uruguay.

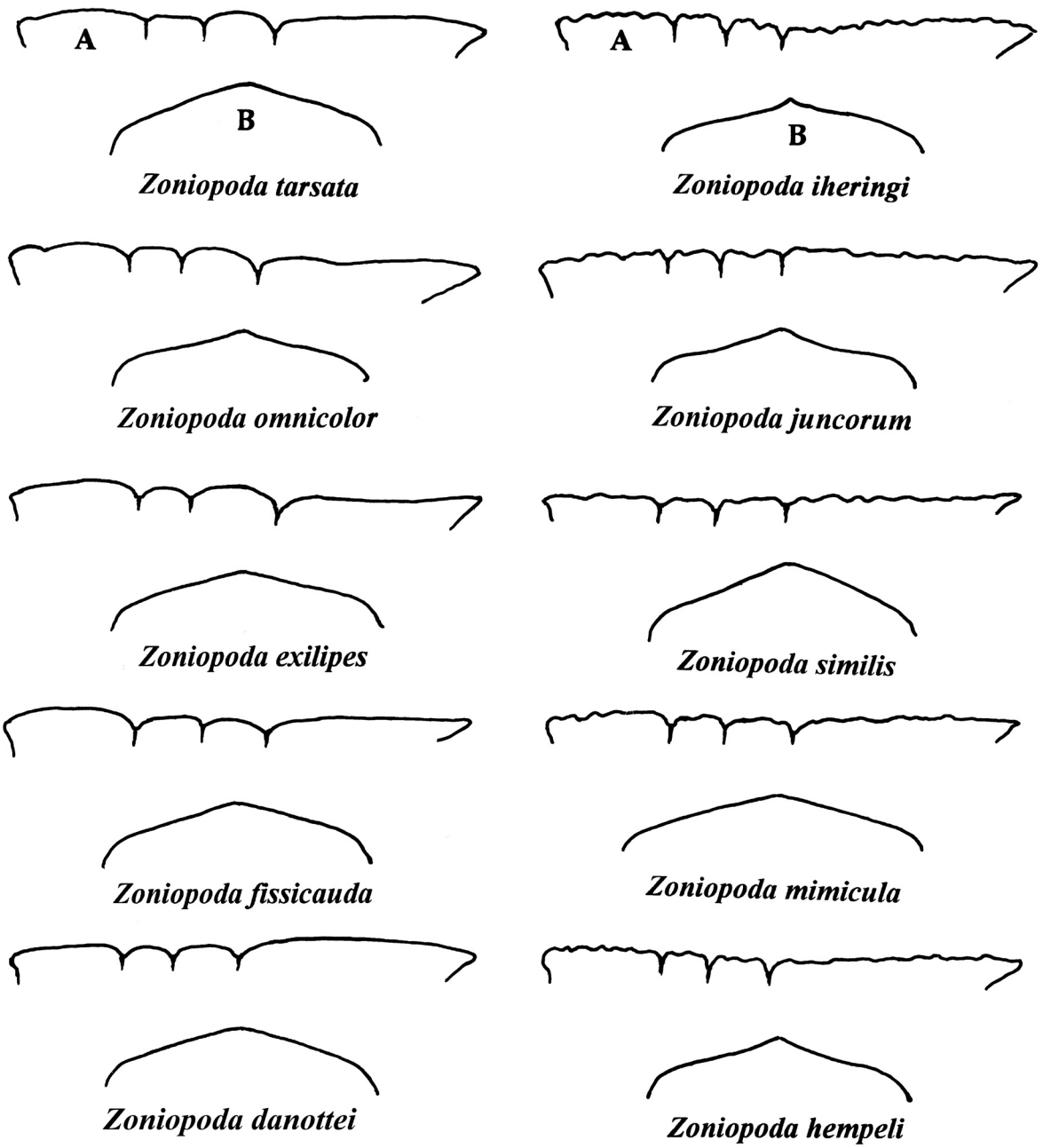

Fig. 8. *Zoniopoda*: **A**. Dorsal carina of pronotum in lateral view. **B**. Transverse section of pronotal metazona. Species as indicated. All drawings different scale, making each drawing of same size.

Habitat, bionomics, food plants.—Among the specimens examined for this work, are some collected by Roberts and Ronderos in the Bolivian Province of Santa Cruz, on the labels of which is recorded "Grassland, low shrubs", this being the only indication I know about the habitat of this species.

Gangwere and Ronderos (1975: 178) class this species among those unselectively polyphagous, with mandibles of the forbivorous type. Virla de Arguello (1978: 115, 116, 118, 119) mentions this species, together with *Chromacris speciosa*, as damaging alfalfa in the Province of Córdoba, Argentina. She qualifies it as abundant and highly dangerous for this crop, illustrates its mandibles of the forbivorous type, and describes its feces as asymmetrical, containing unaligned fragments of dicots. She states that 82.13 % of the feces of *Z. omnicolor* contained only fragments of alfalfa, 10.71 % alfalfa and grasses and 7.14 % of other dicots. From mentions in the literature it can be deduced that this species occasionally becomes destructive for some crops in northern Argentina, but usually only scattered specimens are found.

Zoniopoda exilipes Bruner 1906
(= *Zoniopoda collaris* Bruner 1911)
Figs 3, 6, 8, 12 (habitus), 20

Etymology.— Specific name *exilipes*, from Latin *exilis* (= thin, slender, weak) and *pes, pedis* (= foot). However, individuals of this species do not seem to have their legs noticeably weaker or thinner than those of most other species in the genus. As to the name *collaris*, from Latin *collare*, meaning a band or chain for the neck: this probably

Fig. 9. *Z. tarsata*, egg pod: from Uruguay, Dept. Florida.

refers either to the white band at the posterior part of the head, or to that running along the anterior margin of the pronotum.

Size.— I have measured only two males, one of them slightly over 41 mm, the other 37.4 mm. See Table 1 for other measurements.

Identification.— (Fig. 12) Integument smooth and shiny throughout, impressopunctate on prothoracic metazona and slightly rugose on meso-metapleurae. Median carina of pronotum marked throughout but low; in lateral view its sections between the sulci smooth, without any denticulations. In the two males measured, the prozona was longer than the metazona.

Chromatic characters.— The general aspect of the specimens is of dark-colored insects with small contrasting yellow bands and spots. Dark-colored parts vary from fuscous (21) to black. Yellow parts range from the color of ivory to straw-yellow (56). Antennae: scape fuscous with yellow basal part; pedicel and five basal segments of flagellum fuscous, the rest of the antenna raw umber (23). Head capsule mostly fuscous to black, with the following yellow areas: paired lateral bands at sides of vertex: transverse band on front between antennal sockets and a very narrow one at epistomal suture; irregular vertical bands on front of eyes, and a rather wide one surrounding occiput. Pronotum with narrow yellow band along front edge, and a wide one along caudal edge, that widens downward at the sides and continues on caudal end of proepisternum; meso- and metapleurae fuscous with oblique yellow bands along cephalic edges of epimera, continued on areas of meso-metasterna over leg articulations. Tegmina may be entirely fuscous, or have main veins colored yellow on a fuscous background of membrane and secondary veins; hind wings hyaline, slightly smoked, turning bluish at end of vannal area. Fore and middle legs fuscous, except for small yellow areas on coxa and trochanters. Hind legs with yellow coxae; femora fuscous with three transverse yellow bands: one at leg base, one at end of basal third and one at middle of caudal half; end of rotular area yellowish. Hind tibiae and tarsi fuscous except for a small yellow part at tibial base. Abdominal segments very dark fuscous to black except for narrow yellow caudal edges. Male subgenital plate mostly yellow with fuscous ventral area.

Geographical distribution.— (Fig. 20) The species is a rare one. The few specimens known indicate it is distributed over a large territory that includes parts of the Brazilian states of Mato Grosso, Goias and São Paulo, and eastern Paraguay. That is, between parallels 15 and 27 S and meridians 45 and 58 W.

Nothing has been recorded about its habitat, food plants and bionomics.

Zoniopoda fissicauda Bruner 1906
Figs 3, 6, 8, 13 (habitus), 20

Etymology.— From Latin *fissus* (= cleave, split, *fissura*, = cleft; and *cauda* = tail) referring to the male subgenital plate with its apex markedly divided by a deep median notch (Fig. 6). This notch is present in all species of the genus, but in this species is much deeper than in any other.

Size.— The two males measured are between 37 and 41 mm in length, and the only female is nearly 47 mm. Other measurements in Table 2.

Identification.— Integument smooth, shiny, impressopunctate over most of pronotum, pitted on meso-metapleurae. Pronotum with median dorsal carina well marked but low; without any denticulations on its sections between the sulci as seen in lateral view. In the specimens examined, the prozona was longer than the metazona in males, shorter in females. Male abdominal terminalia as shown in Fig. 6. Male cerci in lateral view downcurved, with rounded apices.

Chromatic characters.— Prevalent color straw-yellow (56) to sulfur-yellow (57), with fuscous (21) or black areas, and parts of head and legs scarlet (15) to chrome-orange (16). Antennae black. Head capsule mostly scarlet to chrome-orange, darkened on fastigium and frons, becoming almost black on clypeo-labrum. Pronotum straw-yellow (56); dorsally black-banded between transverse sulci 1-2 and 3-4 and on anterior part of metazonal dorsum. These black bands reach down to the middle of the lateral lobes: the one between sulci 3-4 turns forward to the area between sulci 2-3, and in some specimens forms a rather large dark spot in this area. Tegmina appear to be bluish-green with yellow veins in individuals with their wings folded, but when these are extended it can be seen that they are pale greenish-yellow, both in membrane and veins, and that the bluish tinge comes from the folded hind wings under the tegmina. These hind wings when extended are translucid and tinged with lavender (77). In meso-metapleurae, episterna 2 and 3 have cephalic and caudal thirds black, middle third yellow; epimera 2 and 3 are yellow; spiracle 2 shiny black. Fore and middle legs are yellow with coxae, basal and upper parts of femora tinged with chrome-orange (16); the latter with two black transverse bands sub-basal and sub-

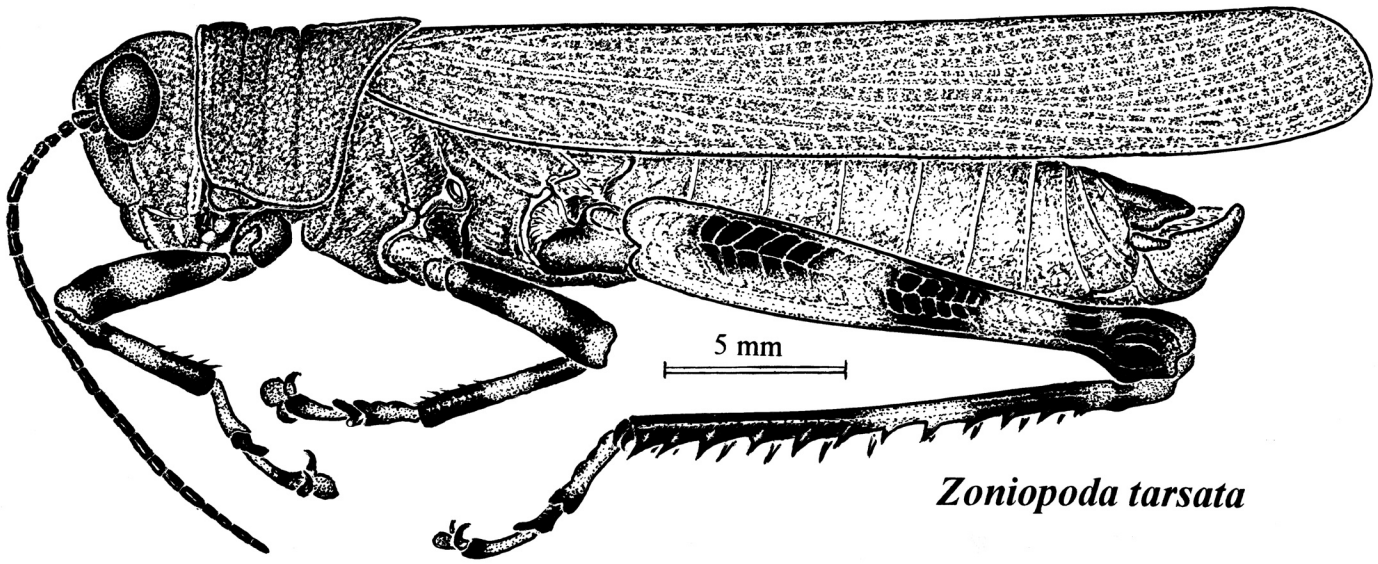

Fig. 10. *Zoniopoda tarsata* (Serville 1831); male, from Brasil, Rio Grande do Sul, Nonoai. Length 35 mm.

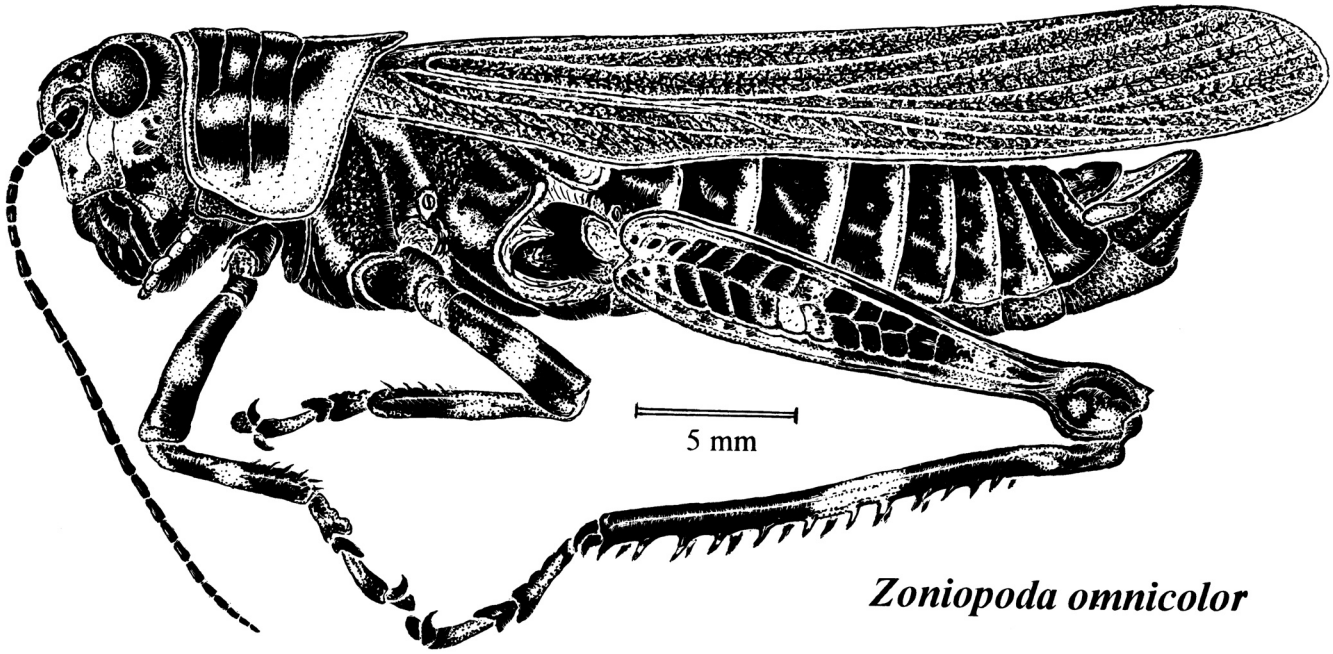

Fig. 11. *Zoniopoda omnicolor* (Blanchard 1843); male, from Paraguay, Sapucay. Length 40 mm.

apical, as shown in Fig. 13; these bands can be well-marked or faint in different individuals; tibiae are yellow, gradually infuscated towards apices; tarsi mostly fuscous. Hind legs: coxae orange (17), femora yellow with lateral black spots, the first set on the basal part of the first half and the second set on the upper part of apical half and united superiorly, and a black band just anterior to the rotular area which is colored orange. Hind tibiae orange at base, then yellow, tinged with fuscous near its bases and towards its apices; hind tarsi dorsally orange, ventrally fuscous. Abdominal segments with cephalic halves black, caudal ones ivory-colored. Male cerci orange, subgenital plate mostly of this color. In the female, cerci and ovipositor are orange-colored.

Geographical distribution.— (Fig. 20) Specimens have been found in eastern Paraguay and in some places in south central Brazil (Goias, Mato Grosso do Sul). Its range, such as known at present, lies between parallels 20 and 27 S and meridians 50 and 57 W.

Nothing is known of its habitat, food plants and bionomics.

***Zoniopoda danottei* n. sp.**
Figs. 3, 6, 8, 14 (habitus), 20

Holotype.— a male labeled: "Brazil: NE side of Brasilia, 4 Feb.´74 (Otte)- BR-8".

Paratypes.— Two females with identical labels as the holotype. Holotype and paratypes deposited in PHILADELPHIA.

Size.— Male holotype 38 mm, female paratypes 43.4 and 46.7 mm. Other measurements in Table 8.

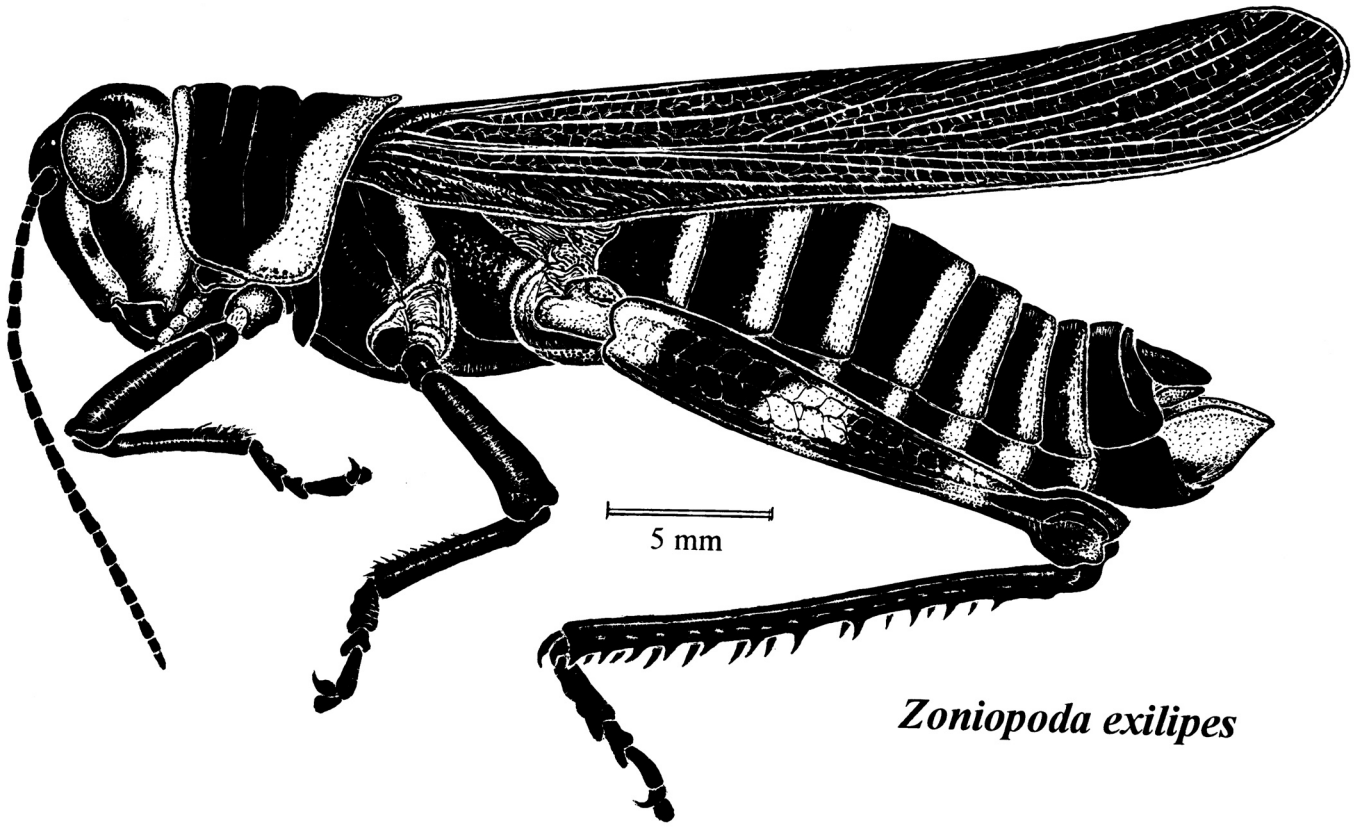

Fig. 12. *Zoniopoda exilipes* Bruner 1906; male from Paraguay, Sapucay. Length 41 mm.

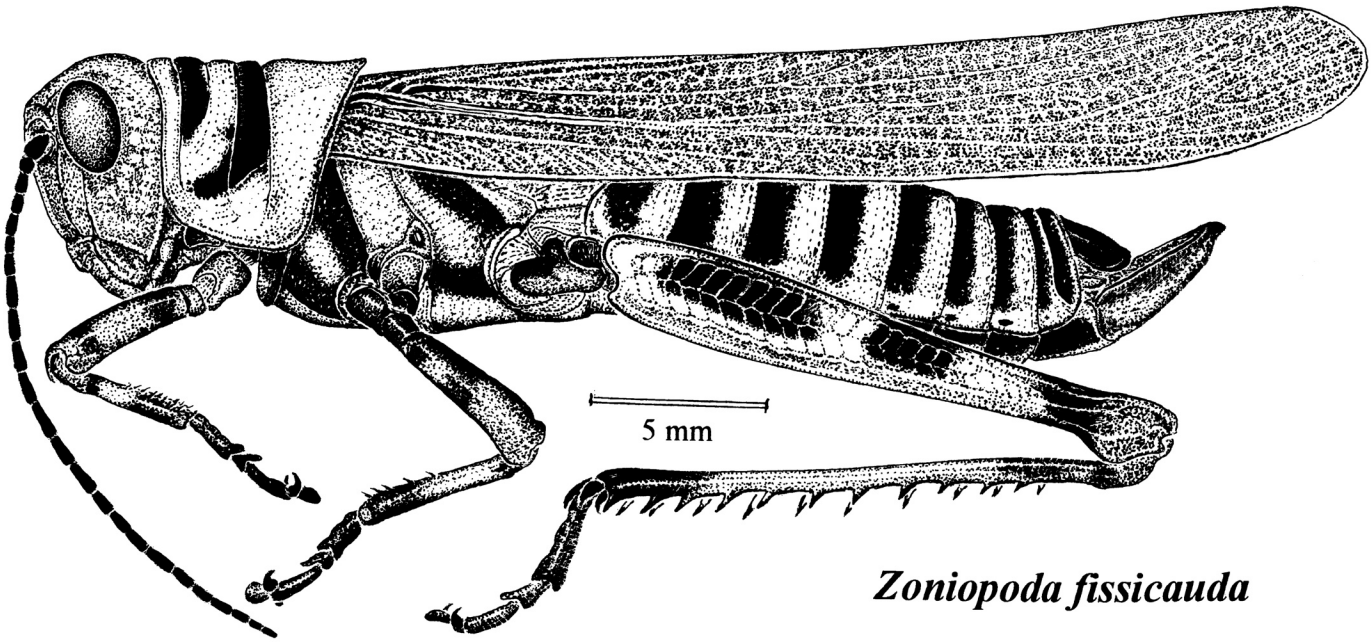

Fig. 13. *Zoniopoda fissicauda* Bruner 1906; male from Brasil, Mato Grosso do Sul, north of Campo Grande. Length 38 mm.

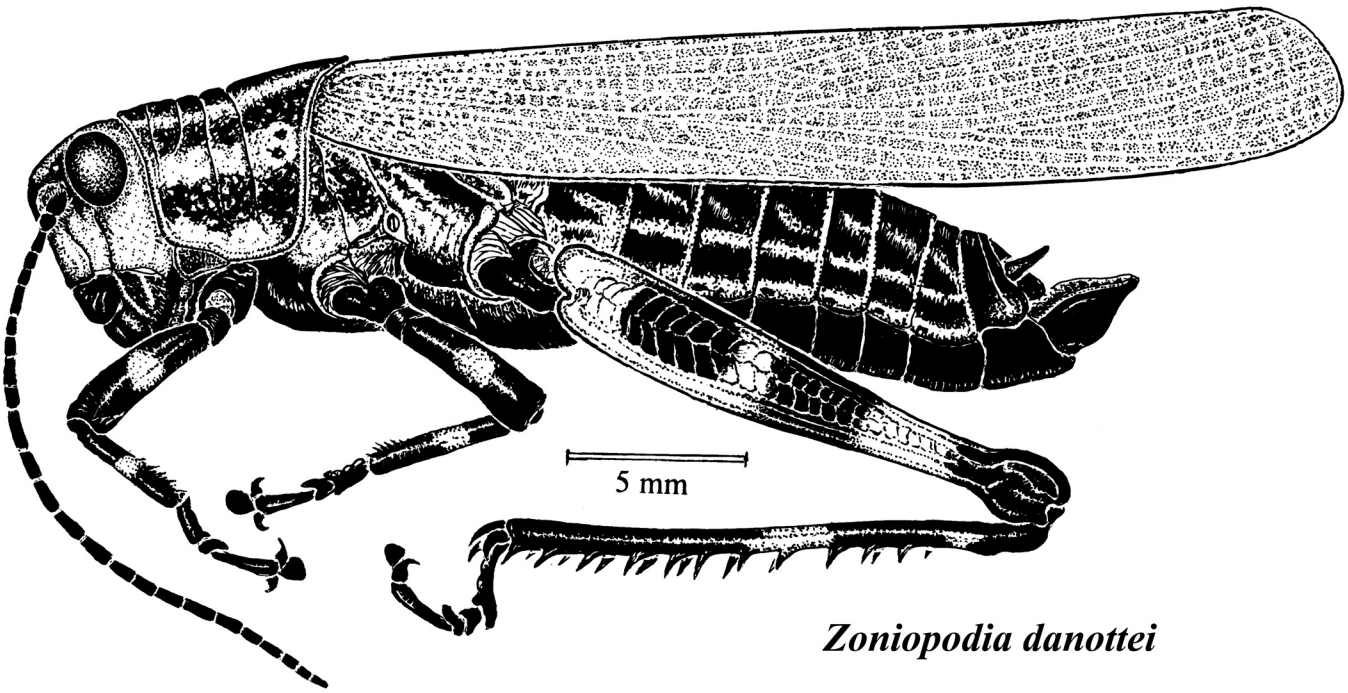

Fig. 14. *Zoniopoda danottei* n. sp.; male from Brasil, Distrito Federal. Length 37 mm.

Etymology. Dedicated to Dr. Daniel Otte, who collected all known specimens of this species, in recognition of his many and valuable works on Orthoptera.

Identification.— (Fig. 11) This species is closely allied to *Z. tarsata*, of which it seems at first sight to be a dark-colored and more robust form. Several anatomical and chromatic characters however, point to its being a separate species evolving from the same source as *tarsata* at the northern limit of the territory occupied by the genus. Integument strongly rugose on thorax, less so on abdomen, smooth on head and legs. Mid-dorsal pronotal carina marked, but not too prominent, smooth in profile between transverse sulci. In the specimens measured, the prozona was shorter than the metazona for both males and females. Male abdominal terminalia as shown in Fig. 6.

Chromatic characters.— In general similar to those of *Z. tarsata*, with the noticeable difference of more extensive black areas and the absence of any red color on the legs, this color being present only on the head. Antennae black. Head chrome-orange (16) except on fastigium, which is mostly black, this color extending to the part of the frons above lower margins of eyes and antennal sockets. Clypeo-labrum and mandibles black, and also of this color maxillary and labial palpi (these yellow in *Z. tarsata*). Pronotum strongly banded longitudinally with black and yellow; in dorsal view with a narrow yellow band along dorsal carina, and two wider ones along lateral carinae; two yellow bands on lateral lobes, upper ones at middle of lobes, lower ones along ventral edges. Such distribution of bands similar to that described for some individuals of *Z. tarsata*, where these bands when present, are far less evident. Meso and metapleurae yellow, the lower black band of the lateral lobe extending onto them, being here wider and rather fragmented and interrupted in some places by small yellow areas. Tegmina with yellow veins on almost hyaline membrane; hind wings hyaline but tinted with lavender (77). Fore and middle legs with black coxa and trochanter; femur black with yellow transverse band near middle; tibia black with transverse yellow band near middle; tarsus black. Hind legs: coxa and trochanter black; femur yellow with black latero-dorsal band at middle of basal half, a complete black band behind middle of femur and another black band covering end of femur including rotular area. Tibia with basal half black except for small dorsal yellow patch near base; a wide yellow area just behind middle of tibia; apical half and tarsus black. Abdomen mostly black, with longitudinal yellow markings and bands as shown in Fig. 14. Abdominal terminalia mostly black, epiproct as in Fig. 6. Cerci and paraprocts of female black; ovipositor mostly yellow.

Geographical distribution.— (Fig. 20) The species is known only from the type series, collected in the Federal District of Brazil, northeast of the city of Brasilia. Nothing is known of its bionomics and food plants.

IHERINGI species group

The species of this group are all of green color, without the many markings present in those of the Tarsata group. Identification is possible however, by means of some characters, chromatic and of form, that will be described for each of the species. Primarily, the species of this group could be separated by the following key. Identifications obtained with it must be confirmed by following the corresponding descriptions.

Key to the species in the Iheringi species group

1 Large size. Males 45 mm, females 54 to 61 mm; rotulae of hind femora with black spot (Fig. 16); all tibiae and tarsi bright red. . . . . *juncorum*

1′ Smaller. Largest males 40 mm. Largest females 50.5 mm; rotulae of hind femora without any black color 2

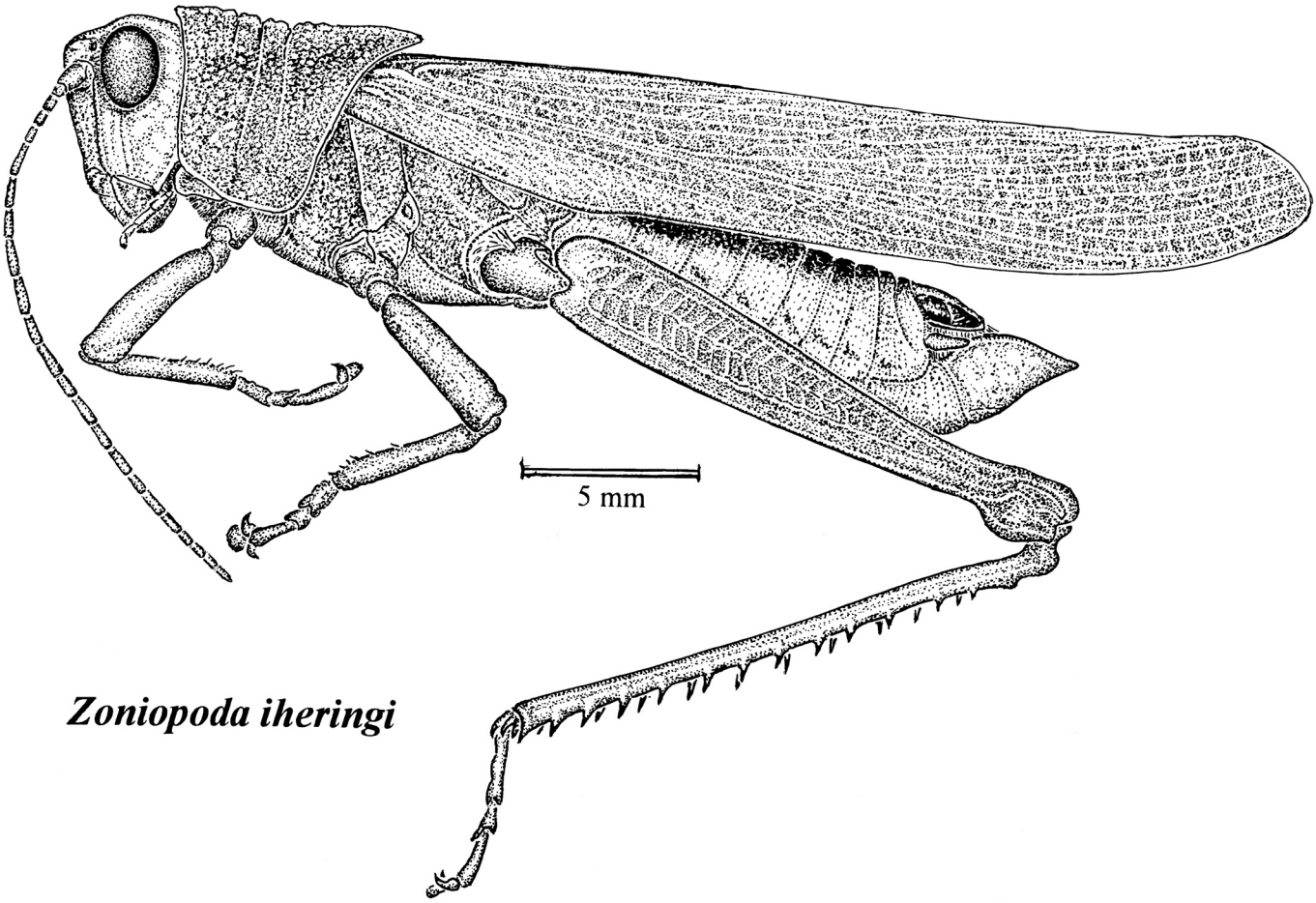

Fig. 15. *Zoniopoda iheringi* Pictet & Saussure 1887; male from Uruguay, Dept. Tacuarembó, Caraguatá. Length 35 mm.

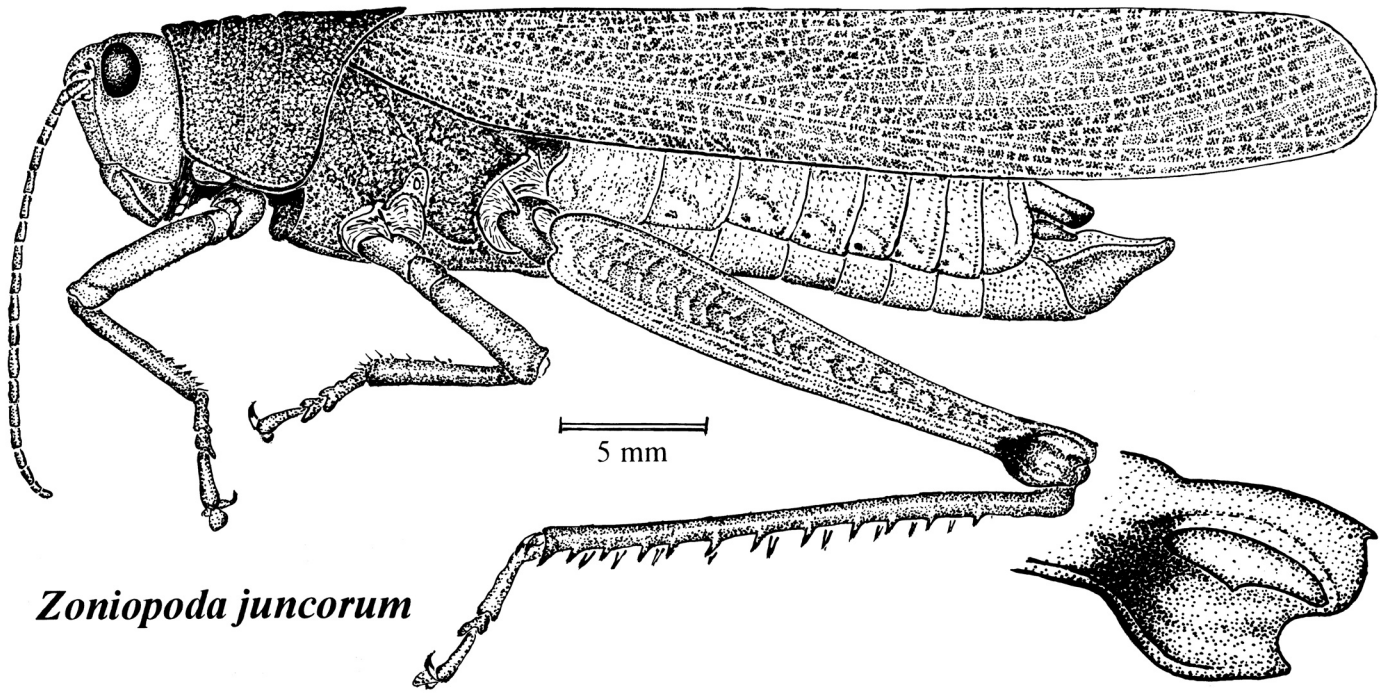

Fig. 16. *Zoniopoda juncorum* Berg 1887; male from Uruguay, Dept. Florida, Casupá. Length 44 mm.

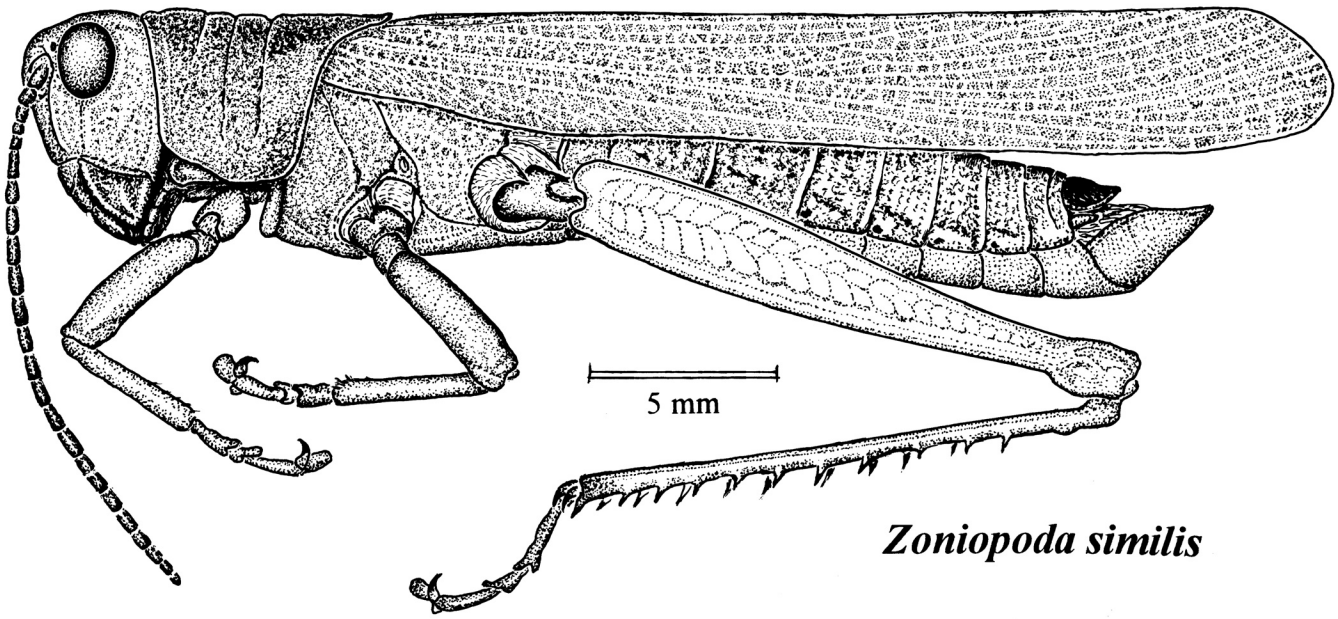

Fig. 17. *Zoniopoda similis* Bruner 1906; male from Brasil, Rio Grande do Sul, Ronda Alta. Length 34 mm.

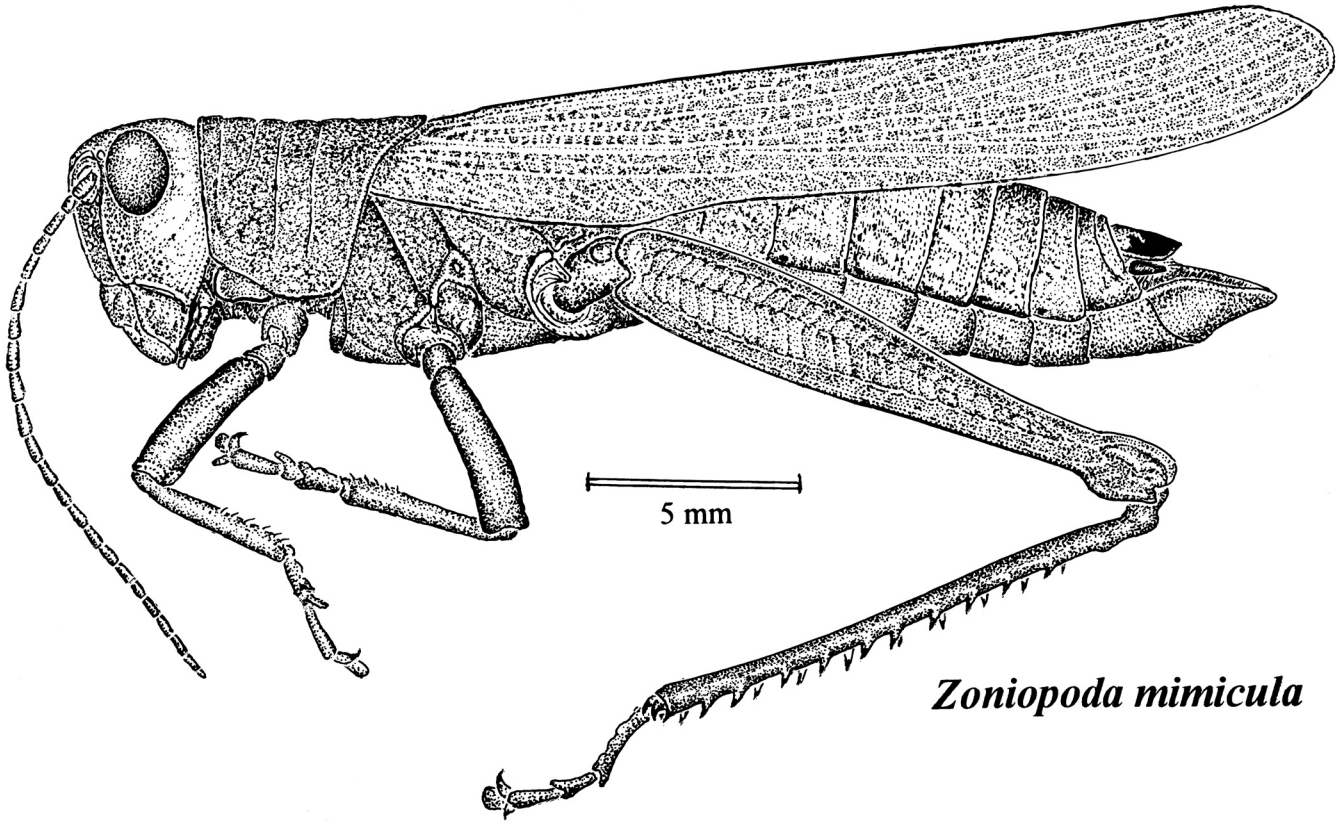

Fig. 18. *Zoniopoda mimicula* Rehn 1909; male from Brasil, Mato Grosso, Chapada dos Guimaraes. Length 30 mm.

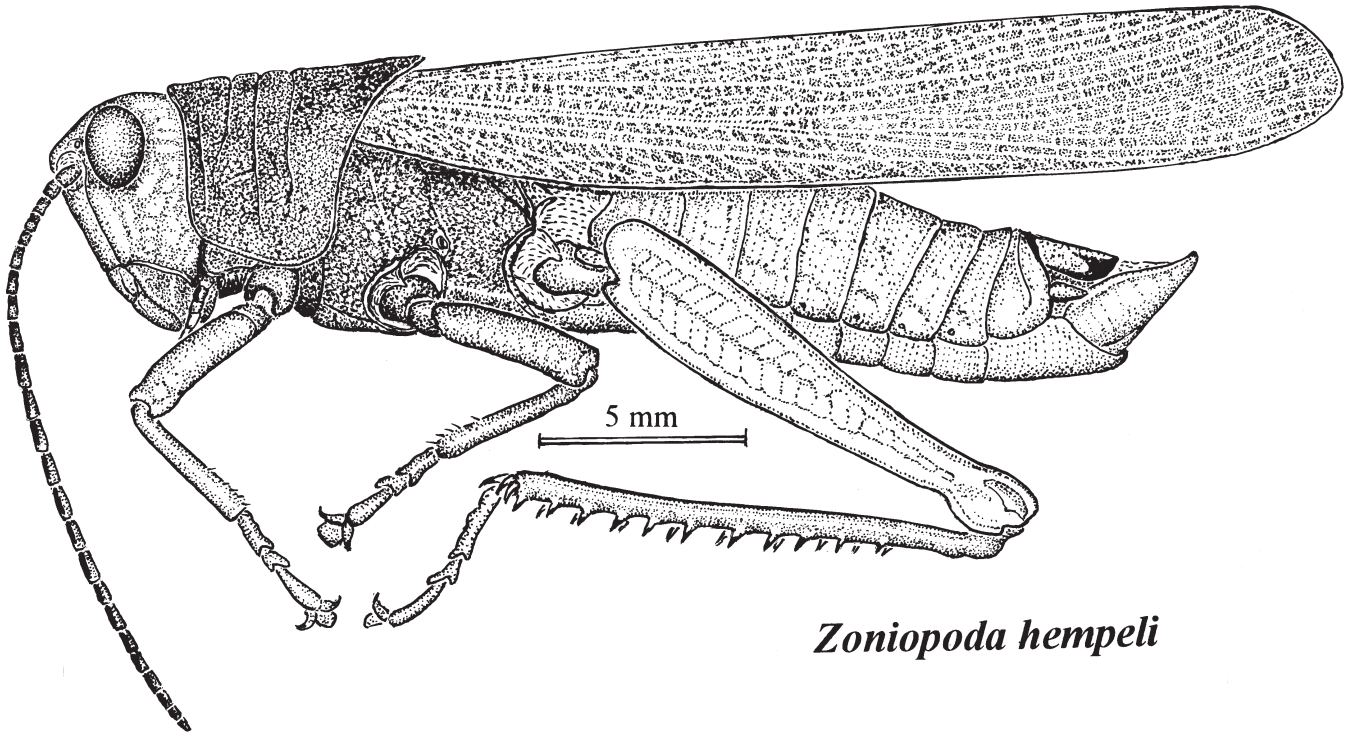

Fig. 19. *Zoniopoda hempeli* Bruner 1911; male from Brasil, Rio Grande do Sul, Ronda Alta. Length 31 mm.

2 Pronotum with narrow yellow band along median dorsal carina . . . . . *similis*
2′ Pronotum without median dorsal yellow band 3
3 Tegmina with two yellow lines due to yellow color of longitudinal veins, one on veins subcosta+radius 1-2; the other on second cubital + vannals 1-2 . . . . . *hempeli*
3′ Tegmina uniformly green, without any yellow markings 4
4 Hind tibiae and tarsi red except for small portion of hind tibiae at femoral articulation . . . . . *mimicula*
4′ Tibiae and tarsi of all legs from pale pink to (rarely) red . . . . . *iheringi*

Zoniopoda iheringi Pictet & Saussure 1887
Figs 4, 7, 8, 15 (habitus), 20

Etymology.— The specific name was dedicated to Dr. Hermann von Ihering, a German naturalist living at the time in Rio Grande do Sul, Brasil, who collected the type specimen.

Size.— Males from 32.5 to 35.7 mm, females from 44 to 50 mm. Other measurements in Table 4.

Identification.— Integument strongly rugose, becomes tuberculate on pronotum. Pronotum: dorsal median carina high and serrate. In all specimens measured, the prozona was markedly shorter than the metazona. Abdominal terminalia in males as in Fig. 7; characteristic are the furculae of 10th segment, placed close together, and the epiproct wide and posteriorly rounded.

Chromatic characters.— General color yellowish-green, varying in different individuals from citrine (51) to lime green (59). In the legs the color of tibiae-tarsi may differ from that of the body by being reddish, in the darkest specimens becoming almost ferruginous (41). Tegminae are almost hyaline, yellowish green with yellow veins; hind wings have a hyaline remigium, while the vannus is in some cases pink (7) to ruby (10), in others mauve (75) to lilac (76) (see below).

With reference to this species, Rehn (1905: 38) examining a male and a female specimen from Sapucay (Paraguay), says: "in the male the caudal femora are obscurely bi-annulate with blackish-fuscous". In the many specimens of this species I have examined, I have not found any with caudal femora as described by Rehn. It may be a *lapsus calami*, or we may suppose that the only male Rehn was examining belonged to another species.

Geographical distribution.— (Fig. 21). The species has been found in Brazil (States of Mato Grosso, Mato Grosso do Sul, Goias, São Paulo, Santa Catarina, and Rio Grande do Sul; in Eastern Paraguay; in Argentina, provinces of Jujuy, Salta and Misiones; in Uruguay over most of its territory. Distribution in Argentina must certainly be greater than indicated by the few specimens at hand.

Habitat, bionomics, food plants.— Individuals of this species have been found in places with vegetation of tall grasses and herbaceous dicots. Little is known of its food plants and bionomics: Gangwere and Ronderos classify it as unselectively polyphagous, and state that its feces contain remnants of dicots.

Zoniopoda juncorum Berg, (*in* Pictet & Saussure 1887)
Figs 4, 7, 8, 16 (habitus), 21

Etymology.— From Latin *juncus*, meaning rush, referring to the habitat of this species, it being found on rushes.

Size.— The largest species in the genus. Male 45 mm; females 54 to 60 mm. Other measurements in Table 5.

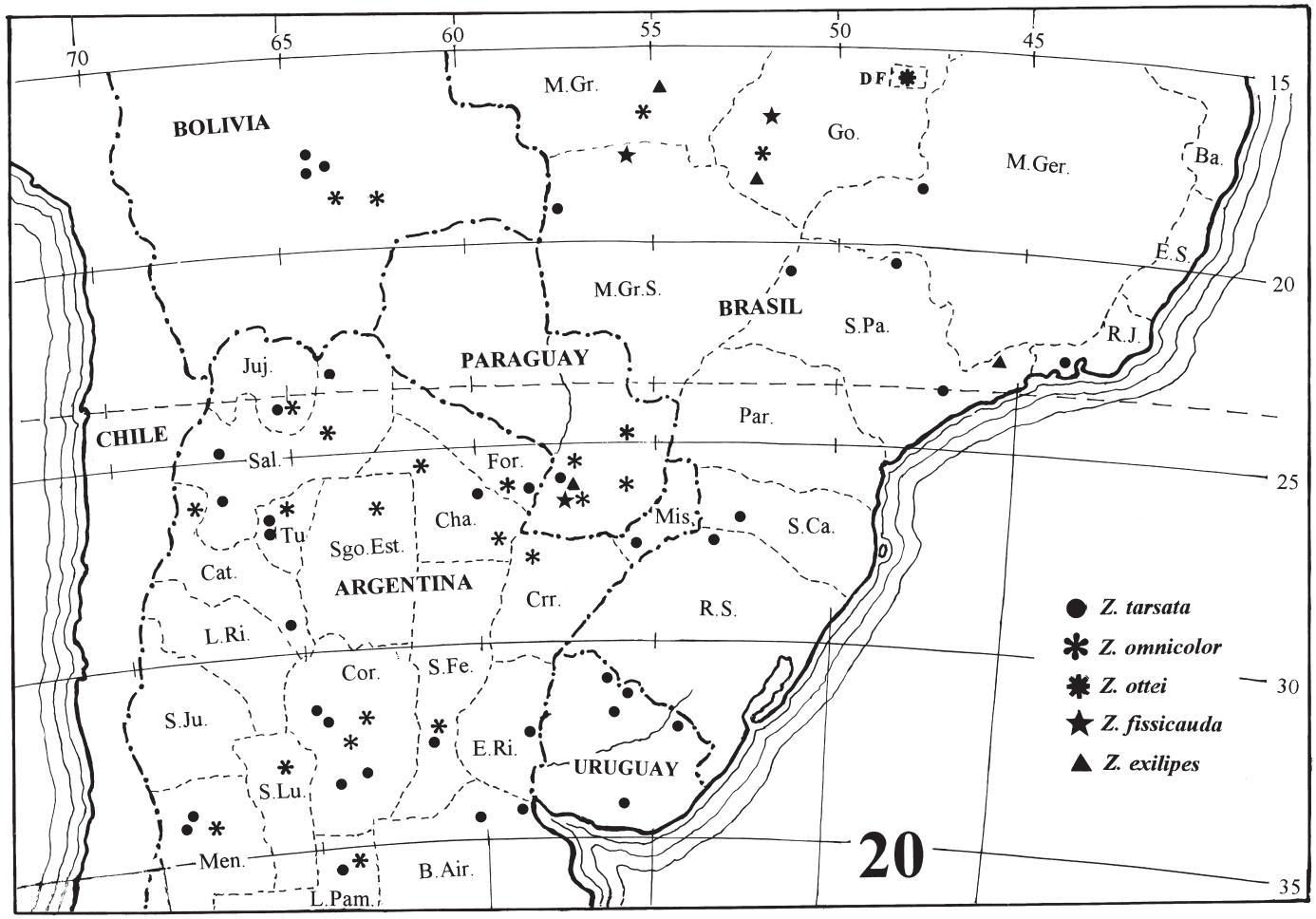

Fig. 20. *Zoniopoda*, group Tarsata, geographical distribution, species as indicated. Abbreviations: (Argentina, provinces) B.Air. Buenos Aires; E.Ri. Entre Rios; Cat. Catamarca; Cha. Chaco; Cor. Córdoba; Crr. Corrientes; For. Formosa; Juj. Jujuy; L.Pam. La Pampa; L.Ri. La Rioja; Men. Mendoza; Mis. Misiones; Sal. Salta; S.Ju. San Juan; S.Lu. San Luis; S.Fe, Santa Fe; Sgo.Est. Santiago del Estero; Tu. Tucumán. (Brasil, states) Ba. Bahia; DF. Distrito Federal; E.S. Espirito Santo; Go. Goias; M.Ger. Minas Gerais; M.Gr. Mato Grosso; M.Gr.S. Mato Grosso do Sul; Par. Parana; S.Ca. Santa Catarina; R.J. Rio de Janeiro; S.Pa. Sao Paulo; R.S. Rio Grande do Sol.

Identification.— Integument rugose, tuberculate on pronotum. Pronotal dorsal carina low, rather indistinct on prozona, well marked on metazona, its upper surface between transverse sulci irregular or granulose. In the specimens measured the prozona was shorter than the metazona. Male terminalia (Fig. 7) with small rounded furculae placed close together, epiproct angulate at sides and posteriorly.

Chromatic characters.— General color olive-yellow (52). Tibiae-tarsi of all legs light red (11). Characteristic of this species is a small crescent-shaped black macula at the base of the rotular region of hind femora (Fig. 16), not found in any other of its group.

Geographical distribution.— (Fig. 21). Reported by several authors from Bolivia (Caiza); Paraguay (Rio Confuso); Argentina (Chaco, Salta, Jujuy, Santa Fe, Buenos Aires) and Uruguay.

Habitat, food plants, bionomics.— I have found this species only once in southern Uruguay: about a dozen individuals perching on rushes (*Scirpus* sp.) growing in water. It has been found in Argentina in exactly the same habitat. Whether rushes are fed on by the insects is not known. In fifty years' collecting in South America, I have never found the species again, not even in the place where I first collected them, which I have visited many times. The species is apparently a rare one.

Zoniopoda similis Bruner 1906
Figs 4, 7, 8, 17 (habitus), 21

Etymology.— Latin *similis,* meaning like, resembling. An adjective frequently used as a specific name without any definite meaning. In his description Bruner says that this species resembles *Z. tarsata*, and this can be taken as the meaning of *similis* in this particular instance. However, the likeness of this species with *Z. tarsata* isn't readily apparent.

Size.— Males from 31.2 mm to 37.2 mm. Females from 39 to 47.7 mm. Other measurements in Table 9.

Identification.— (Fig. 17) Integument rugose except on top of head and legs. Dorsal carina of pronotum low, smooth dorsally. In the specimens measured, the prozona was longer than the metazona in all males but one, and shorter than the metazona in all the females. Abdominal terminalia of male (Fig. 7) with furculae placed close

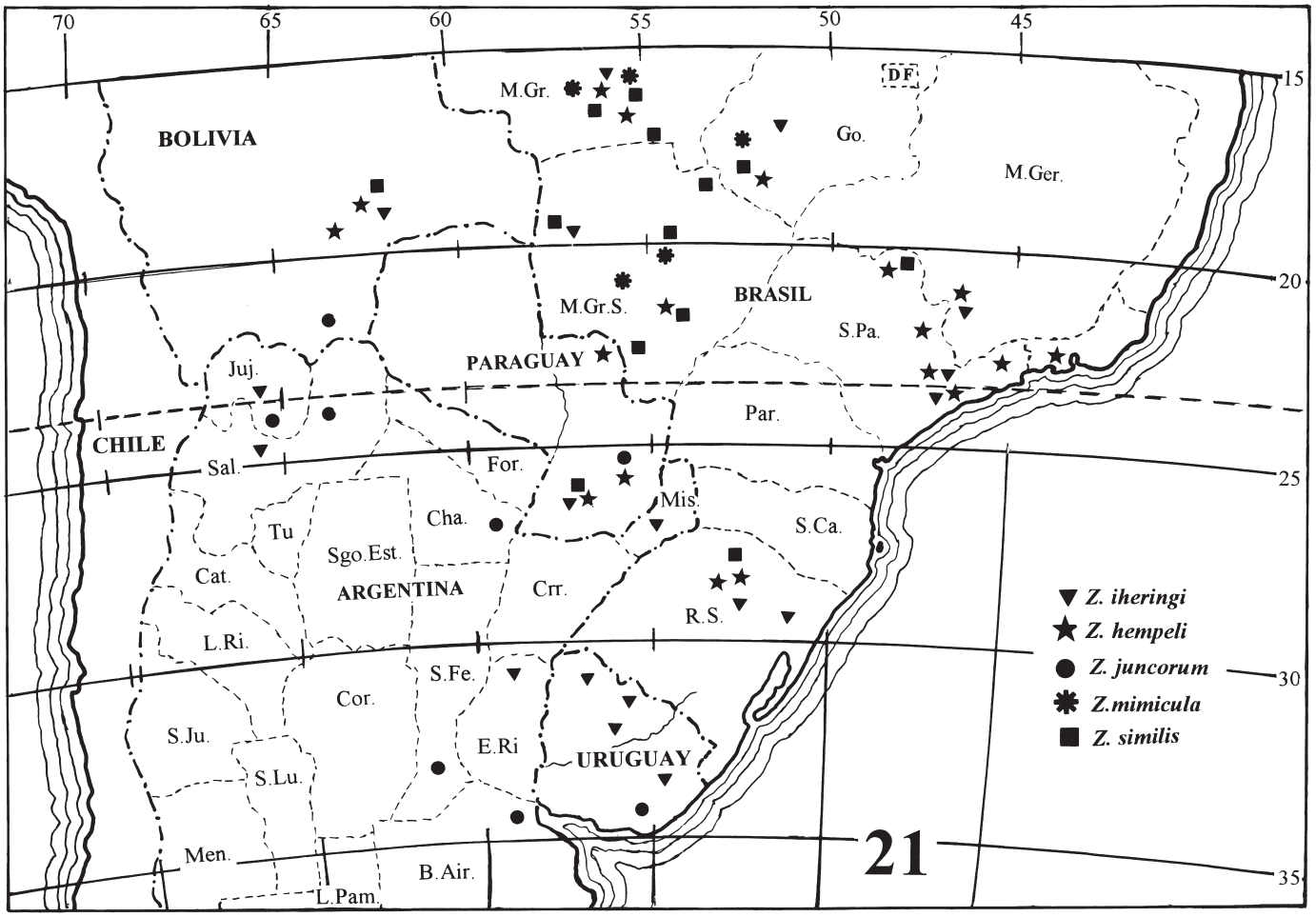

Fig. 21. *Zoniopoda*, group Iheringi, geographical distribution, species as indicated. Abbreviations as in Fig. 20.

together, pointed or rounded; epiproct with rounded caudal edge.

Chromatic characters.— Antennae cinnamon (39). Head, body, tegmina and legs (except for tarsi) olive-yellow (52) to sulphur-yellow (56). Very characteristic of this species are: a narrow yellow band running along dorsal carina of pronotum, and the bright red (11) color of the hind tarsi and tips of hind tibiae, this color also present but less intense on same parts of front and middle legs. Hind wings of all specimens examined are hyaline, tinted with lavender (77) towards the vannal region.

Geographical distribution.— (Fig. 21) Bolivia: Santa Cruz. Brasil: States of Mato Grosso, Mato Grosso do Sul, Goias, São Paulo, and Rio Grande do Sul. By the recorded distribution in Brasil it is very probable that it lives also in the intervening states of Santa Catarina and Parana. It has not been found in Uruguay.

Habitat, food-plants, bionomics.— Nothing on these subjects is recorded in the literature.

Zoniopoda mimicula Rehn 1909
Figs 4, 7, 8, 18 (habitus), 21

Etymology.— From Greek, *mimos*, an imitator, an actor. Rehn states in his description that this species closely resembles *Z. iheringi*, and this might be the reason of his naming this species as *mimicula*.

Size.— Males 31 to 37 mm, females 42 to 50.5 mm. Other measurements in Table 6.

Identification.— (Fig. 18) Integument rugose, except on top of head and legs. Dorsal carina of pronotum almost obsolete on prozona, only slightly marked on metazona, its dorsal profile irregular between transverse sulci. In the specimens measured, prozona and metazona were of equal length or either one was slightly shorter or longer than the other. Male abdominal terminalia (Fig. 7) with very small, rounded furculae placed close together; epiproct slightly pointed caudad, with rounded edges.

Chromatic characters.— Antennal segments drab (27) with distal edges yellow. General color of head, body, tegmina and legs olive-yellow (52) to sulphur-yellow (56) except hind tibiae and tarsi which are light red (11). Hind wings of the few specimens examined have the remigium hyaline, and the vannus tinged with lilac (76).

Geographical distribution.— (Fig. 21) This species is reported from Brazil, states of Mato Grosso, Mato Grosso do Sul and Goias, from eastern Paraguay and from Prov. of Tucumán in Argentina. Its distribution is probably much larger than that recorded on the basis of the few specimens in collections.

Habitat, bionomics, food plants.— Nothing has been reported on these subjects.

Zoniopoda hempeli Bruner 1911
Figs 4, 7, 8, 19 (habitus), 21

Etymology.— Bruner dedicated this species to its collector, the entomologist A. Hempel of Sao Paulo, Brazil.

Size.— Males range from 31.5 to 39.8 mm, females from 39.0 to 47.7 mm. See Table 3 for other measurements.

Identification.— This is the most common and abundant species of the Iheringi Group. Integument rugose except on top of head and legs. Pronotal median carina (Fig. 8) well marked throughout but not ridge-like, slightly irregular between transverse sulci. In all specimens measured the prozona was shorter than the metazona. Male abdominal terminalia (Fig. 7) made characteristic by wide, rounded furculae placed far apart, and epiproct with straight sides bent laterally at an obtuse angle and then meeting apically also in an obtuse angle.

Chromatic characters.— Antennal segments drab (27), yellow at distal ends and sides. Body and legs olive-yellow (52) to sulphur-yellow (57) except for hind tibiae and tarsi that are pale salmon color (6) or flesh color (5). Characteristic of this species are the veins of the tegmina which are spectrum-yellow (55): the subcosta and radius 1 and 2, being close together form conspicuous yellow lines at the limits of the discal and lateral parts of the tegmina. Also the second cubital and vannal veins 1 and 2 form another, less notable yellow line lower down on the tegmina. These bands are most visible in living and in well-preserved collection specimens: they can fade in poorly preserved ones. They are also better marked in specimens from the southern parts of the species' range, less so in those from the northern parts. Hind wings have the remigium hyaline, the vannus either pink (7) or lavender (77) in different individuals: specimens from the Brazilian states of Mato Grosso, Goias, Minas Gerais, Rio de Janeiro and São Paulo have pink wings, while those from southeastern Bolivia, eastern Paraguay, the Brazilian states of Mato Grosso do Sul and Rio Grande do Sul, have lavender wings.

Geographical distribution.— (Fig. 21) This species has been found over a large territory that includes the north of the Province of Junín in Peru, the southern part of the Province of Santa Cruz in Bolivia, most of Paraguay and the Brazilian states of Mato Grosso and Mato Grosso do Sul, Goias, Minas Gerais, Rio de Janeiro, São Paulo and Rio Grande do Sul, (very probably also Santa Catarina and Parana). The specimens (in PHILADELPHIA) from the Province of Junín in Peru mark the most northern and western locality where a species of this genus has ever been found. They are labeled "Chanchamayo, 1000 m. Peru", without indication of province or collector. Among several localities of this name in Peru, I have chosen the one in Junín as the most probable, since the River Chanchamayo in northern Junín flows at altitudes of about 1000 m. However, the presence of this species in Peru needs to be confirmed.

Habitat, food plants, bionomics.— Habitat of this species, as observed in northern Rio Grande do Sul (Brazil) and in Sapucay (eastern Paraguay) is vegetation consisting of tall herbaceous plants at the edges of native woods. Nothing is known of its food plants.

Unidentifiable specimens

Among the materials available to me for this revision, I have found two male specimens of the Iheringi group that are different from any of the species referred to above, and also from each other. One of them comes from Uruguay, Department of Rivera, Sierra de la Aurora, the other from eastern Paraguay, Province of Caaguazu, near the town of Ihu (Fig. 7). I collected the first in March 1961 and the second in March 1965. I am refraining from describing them as new species until more materials become available that allow me to be sure about their status.

Acknowledgements

Much of the preliminary work related to this paper was conducted in the museums where the types of the species studied are kept. Most of it however, was done in the Universidad de la República, Uruguay, under the auspices of the "Programa para el Desarrollo de las Ciencias Básicas" (PEDECIBA). I gratefully acknowledge the help of the curators and collection managers of the museums visited in the course of this work, for their assistance during my visits and the loan of specimens and types. Among them, particularly C. Amedegnato, D. Azuma, A. Bachmann, C.A. Campos-Seabra, M.M. Cigliano, A. Mesa, M.A. Monné, E. Morales-Agacino, D.A. Nickle, P.I. Persson, B.C. Ratcliffe, H.R. Roberts, R.A. Ronderos and S. Turk are thanked for their help. I am very grateful to T.J. Cohn and D. Otte for their help and encouragement throughout my work. Dr. Cohn made a revision of my MS, making useful suggestions for its improvement. My thanks too, to an anonymous reviewer who made very useful suggestions for the improvement of my text. And, as always, to my wife Albina and other members of my family for their sustained help on the domestic front.

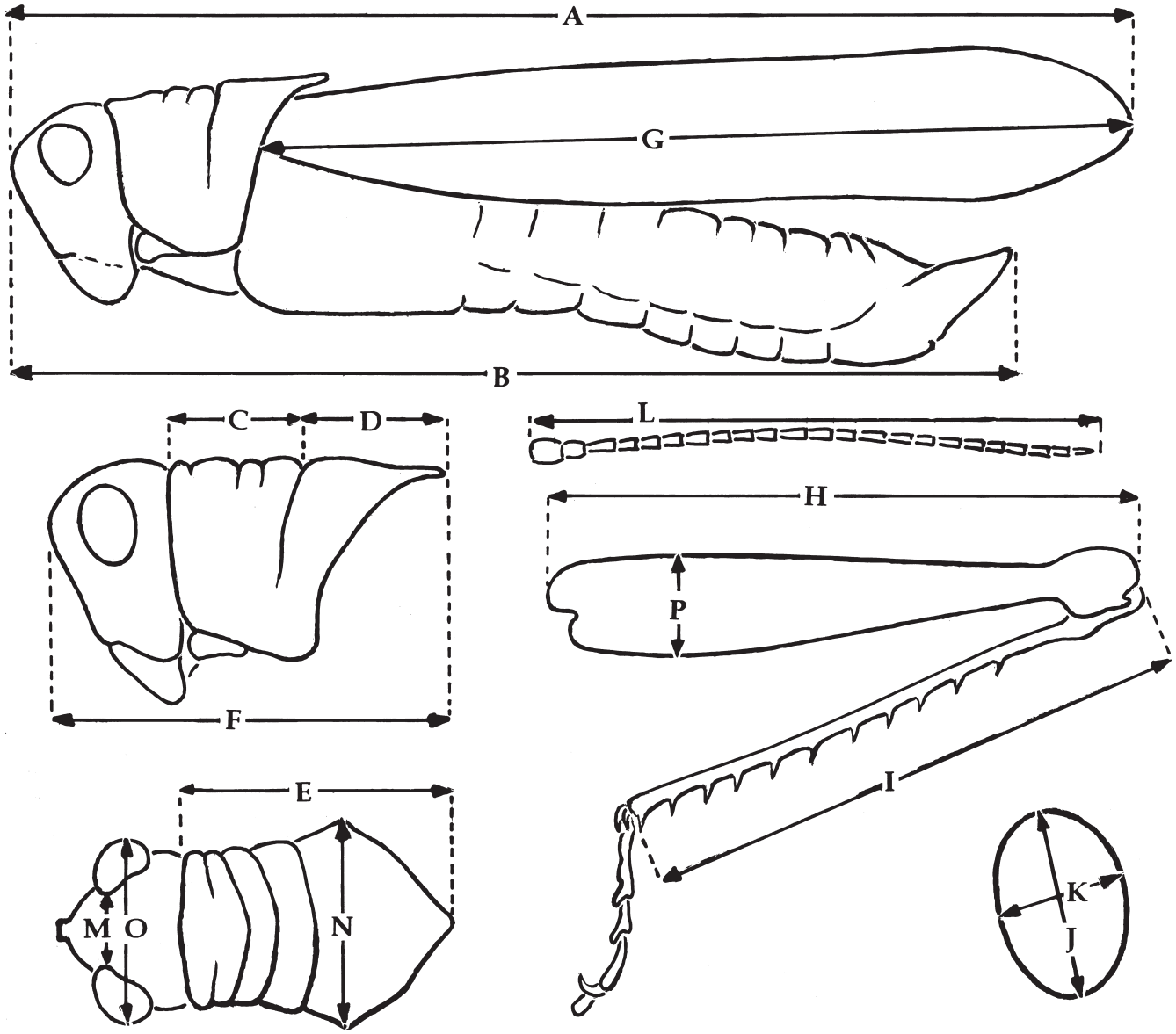

Fig. 22. *Zoniopoda*, measurements taken (A, B, C, etc. see APPENDIX II, Tables 1 to 10).

APPENDIX I. The genus *Zoniopoda* and its species as recorded in the bibliography. Taxonomy, synonymy, localities of collection, specimens in museums.

Repositories.—The present locations of the types and specimens are given in the text by the following names:

GENÈVE	Muséum d'Histoire Naturelle, Genève, Switzerland.
MONTEVIDEO	Facultad de Ciencias, Universidad de la República, Uruguay.
NEBRASKA	Department of Entomology, University of Nebraska, Lincoln, USA.
PARIS	Museum National d'Histoire Naturelle, Paris, France.
PHILADELPHIA	Academy of Natural Sciences of Philadelphia, USA.
SÃO PAULO	Museu de Zoologia, Universidade de São Paulo, Brasil.
STOCKHOLM	Naturhistoriska Riksmuseet, Stockholm, Sweden.
VIENNA	Naturhistorisches Museum Wien, Austria.

Abbreviations.— In the lists of specimens examined, and also in the mentions of bibliographic data for each species, a number of abbreviations have been used. They are as follows: *biogeogr.*, biogeography; *bionom.*, bionomics; *ecol.*, ecology; *econ.*, economic importance; *btw.*, between; *Dept.*, Department [of a country]; *descr.*, description; *distr.*, geographical distribution; *f.*, female; *illustr.*, illustration; *km*, kilometer(s); *m.*, male; *m alt.*, altitude in meters; *misid.*, misidentification; *nr*, near; *pathol.*, pathology; *Prov.*, Province; *redescr.*, redescription. Months are abbreviated with the first three letters of their names. Other abbreviations are those in current use in scientific papers. The abbreviation "BR" followed by a number refers to the Federal Highways in Brasil.

Genus *Zoniopoda* Stål 1873

Typus generis: Acridium tarsatum Serville 1831 (designation by Rehn 1907:174)

Stål 1873: 32 (descr. of genus), 1878: 17 (redescr. of genus). Pictet and Saussure 1887: 356 (key to species). Brunner von Wattenwyl 1893: 134 (in key to genera). Giglio-Tos 1898: 42 (in key to genera). Bruner 1900: 60 (key to species), 1906: 652 (key to species), 1911: 57 (key to species). Rehn 1907: 174 (selection of *typus generis*). Kirby 1910: 375. Roberts 1941: 239 (in list of Romaleinae). Rehn and Grant 1959: 259 (illustr. phallic complex). Dirsh 1961: 395. Uvarov and Dirsh 1961: 158. Rowell and Flook 1998: 147-156 (phylogeny).

List of species in the genus *Zoniopoda*

The species in the genus *Zoniopoda*, (in alphabetical order) are the following:

collaris Bruner 1911 (= *exilipes*)
cruentata (Blanchard 1843) (*Acridium*) (= *tarsata*)
danottei n. sp.
emarginata Stål 1873 (= *omnicolor*)
exilipes Bruner 1906
fissicauda Bruner 1906
hempeli Bruner 1911
iheringi Pictet and Saussure 1887
juncorum Berg 1887
mimicula Rehn 1909
omnicolor (Blanchard 1843) (*Acridium*)
similis Bruner 1906
tarsata (Serville 1831) (*Acridium*)

In the preceding list, names of valid species are in boldface; other names correspond to junior synonyms. Generic names in parentheses are those under which the corresponding species were described, if different from *Zoniopoda*.

Zoniopoda danottei n. sp.

Type series.— One male holotype and two female paratypes labeled "Brazil, NE side of Brasilia, 4 feb 1974, Otte", in PHILADELPHIA.

Specimens examined.— Only those in the type series.

***Zoniopoda exilipes* Bruner 1906**

Zoniopoda exilipes Bruner 1906: 652 (in key), 654 (description), 1911: 57, 60 (in key; *Z. collaris* possibly a jr. syn.). Rehn 1907: 176 (distr.). Kirby 1910: 376. Liebermann 1939: 181 (distr.). Muma 1952: 8 (paratypes in NEBRASKA). Dirsh 1956: 275 (illustr. epiphallus). Rehn and Grant 1959: 259 (illustr. epiphallus).

Zoniopoda collaris Bruner 1911: 60 (description). Liebermann 1955: 337 (distr.). Rehn 1920: 246 (distr.) Otte 1978: 35 (type in PHILADELPHIA).

Type of Zoniopoda exilipes.— Male type in WASHINGTON with the labels: "*Zoniopoda exilipes* type, Bruner" "Sapucay, Paraguay", "W.T. Foster, collector", "Feb." "Type Nº 9719. USNM" "Lectotype". There is also a female specimen with similar labels except "Mch" instead of February as in the male. Bruner (1906: 655) indicates that the types are those in WASHINGTON, and says that there are two males and one female. In NEBRASKA there are three males and one female of this species, all of them labeled "Type" "Sapucay, Paraguay", that, like the female in WASHINGTON, should be considered paratypes. Muma (1952: 8) lists the NEBRASKA specimens as paratypes.

Type of Zoniopoda collaris Bruner 1911.—Male holotype in PHILADELPHIA, labeled "*Zoniopoda collaris* Bruner Type" "Chapada near Cuyaba, Mato Grosso, Brazil" "Jan". The locality named as "Chapada" by Bruner is Chapada dos Guimarães, some 50 km ENE of Cuiabá in the State of Mato Grosso. It is situated in the *divortium aquarum* of the Amazonas and Parana watersheds. In WASHINGTON there is also a male specimen labeled "*Zoniopoda collaris* Bruner Type" "Chapada nr. Cuyaba, Mato Grosso, Brazil" that must be considered as a paratype.

Specimens examined.— Besides those in the type series, the following: PARAGUAY. 1 m., Dept. Paraguari, Sapucay, Feb 1905. BRASIL. 1 m. State of Goias, Jatai, Fazenda Nova Orlandia, Jan 1964.

When describing *Zoniopoda collaris*, Bruner (1911: 60) writes "I am inclined to believe that this is only a color-variety of *Z. exilipes*...". Examination of the types of these species leaves no doubt of their identity. Their differences are minimal and correspond to intraspecific variation. The species' geographical distribution, according to published data, includes parts of Mato Grosso and Goias in Brasil, and eastern Paraguay. In SÃO PAULO there is a male from Jatai in the SW of the State of Goias and another from Campos de Jordão in the E of the State of São Paulo, near its limit with Minas Gerais. The species is known from a very small series and appears to be rather uncommon. From the examination of the types and other specimens in collections it can be seen that there are some variations in color. The most visible are in the tegmina, that in some specimens are almost entirely black or fuscous, and in others have their veins of a yellowish color.

Zoniopoda fissicauda Bruner 1906

Zoniopoda fissicauda Bruner 1906: 653 (description), 1911: 57 (in key of spp.). Kirby 1910: 376. Rehn 1920: 246 (distr.). Liebermann 1955: 337 (distr.).

Types of Zoniopoda fissicauda Bruner 1906.— Male and female types are in the collection of WASHINGTON, both labeled "*Zoniopoda fissicauda* Bruner Type" "Sapucay, Paraguay" "W.T.Foster Collector" "1/25-01" "Type Nº 9735 USNM". The male, very well preserved, with its left wings spread, is here designated as hololectotype. The female paratype, somewhat discolored, with its wings folded, is undoubtedly conspecific with the male.

As to the geographical distribution of this species, besides its type locality in Paraguay, and the specimens mentioned above from Mato Grosso do Sul, Rehn (1920) indicates it from the town of Goias, in the Brasilian state of Goias.

Specimens examined.— Besides the ones in the type series: BRASIL. State of Mato Grosso do Sul: 1 m., BR 163, 75 km N of Rio Verde do Sul, Jan 1972; 1 m., 1 f., BR 163, 100-150 km N of Campo Grande. State of Goias: City of Goias.

Zoniopoda hempeli Bruner 1911

Zoniopoda hempeli Bruner 1911: 58 (description in a footnote). Rehn 1918: 202 (distr.). Liebermann 1955: 337 (distr.). Mesa *et al*. 1983: 516 (chromosomes).

Type of Zoniopoda hempeli Bruner 1911.— A single male holotype in NEBRASKA, labeled "*Zoniopoda hempeli* Bruner Type" "Sao Paulo, Brazil, A. Hempel, Nº 12". Genitalia of the type were dissected, and a label added "CSC 1337".

Describing *Z. hempeli* Bruner wrote: "...the posterior or radial field of the wings is bright rose-color instead of caerulean". In the light of the present study, however, the case of *Z. hempeli* appears like the one described for *Z. iheringi*, where the color of the wings may be different in different individuals. In the specimens at hand, the Brazilian ones from Jaciara in Mato Grosso, from several localities in northern Rio Grande do Sul (Nonoai, Barro Vermelho, Santo Augusto, Ronda Alta), specimens from eastern Paraguay (Sapucay, Paraguarí, Cerro Corá, Caaguazú, Ihú) and from Santa Cruz de la Sierra in Bolivia, have the wings of a pale purplish-blue color. Brasilian specimens from Jataí in Goias, from the State of São Paulo (Piraçununga, Serra da Cantareira, Franca, Rio Claro, Itirapina), Poços de Caldas in Minas Gerais, Itatiaia in Rio de Janeiro and Nova Alborada in Mato Grosso do Sul, have wings with the remigium and a narrow anterior part of the vannus hyaline, while the posterior part of the vannus is tinged with scarlet. Plotting the above localities on a map, it can be seen that, in a general way, specimens from the western and southern parts of the range of this species (Bolivia, Paraguay, and the Brasilian states of Mato Grosso and Rio Grande do Sul) have blue wings, while those from its eastern part (states of Goias, Minas Gerais, São Paulo and Rio de Janeiro in Brazil) have pink wings. The only exception among the specimens examined is the one from Nova Alborada in Mato Grosso do Sul, Brazil, that has pink wings, while being in territory of the blue-winged specimens (perhaps on its eastern limit).

Geographical distribution.— South central Brasil, including parts of the states of Goias, Minas Gerais, São Paulo, Rio de Janeiro and Rio Grande do Sul. Very probably also in the intervening states of Santa Catarina and Paraná. Southern Peru, Prov. of Junín (?), needs confirmation.

Specimens examined.— Besides the types and other materials in museum collections, 60 specimens from the following localities have been studied in the course of this work: BRASIL. State of São Paulo: Franca, Jan 1911; Campos de Jordão, 1600 m alt. Mar 1965; Piraçununga, Jan 1962; Cantareira, Mar 1906. State of Minas Gerais: Poços de Caldas, Jul 1977; 46 km SE of Itajuba, 1400 m alt. Mar 1980. State of Rio Grande do Sul: Nonoai, Feb 1964; Ronda Alta, Feb 1964; Barro Vermelho, Feb 1964; Santo Augusto Jan 1978. State of Mato Grosso: Jaciara on BR 364, Jan 1972; Crossing of BR 267 and 163, Jan 1972. State of Goias: Jatai, Fazenda Nova Orlandia, Cerrado, Jan 1964;15-30 km E of Mineiros, Mar 1980. State of Rio de Janeiro: Itatiaia, 700 m alt. Apr 1974. BOLIVIA. Dept. of Santa Cruz: Naranjales, near city of S. Cruz, Apr 1962; 18 km SW of City of S.Cruz, 400 m alt. Feb 1976; Btw. Buena Vista and San Carlos, 400 m alt. Feb 1976; 20-34 km S of city of S. Cruz on Rd to Yacuiba, Feb 1976; Ichilo, Feb 1950. PARAGUAY. Dept. Paraguarí: Sapucay, Mar 1965; Paraguarí, Mar 1965. Dept. Amambay: Cerro Corá, Jan 1972. Prov. Caaguazú: Caaguazú, Mar 1965; Ruta Caaguazú-Ihú, 40 km N of Caaguazú, Mar 1965. PERU. 1 m., 1f., Prov. [Junín?], Chanchamayo, 1000 m alt.

Zoniopoda iheringi Pictet and Saussure 1887

Zoniopoda iheringi Pictet and Saussure 1887: 357 (description). Bruner 1906: 653 (distr.), 1911: 59 57,59 (distr.), 1913: 471 (distr. habitat). Kirby 1910: 376. Rehn 1907: 174 (distr.), 1913: 333 (distr., size variation). Liebermann 1939: 181 (distr.), 1945: 236 (distr.), 1955: 337 (distr.). Roberts 1941: 239 (in list of Romaleinae). Baucke 1954: 9 (distr.). Mesa 1956: 35 (chromosomes). Rehn and Grant 1959: 259 (in tribe Zoniopodini, illustr. epiphallus). Gangwere and Ronderos 1975: 178 (food selection). Mesa *et al* 1983: 516 (chromosomes). Costa and Jantsch 1999: 141 (distr.).

Types of Zoniopoda iheringi Pictet and Saussure 1887.— There is in GÈNEVE a series of five males and five females, all with green hand-written labels: "*Zoniopoda iheringi* Pictet". Of these specimens, four males and three females also have white printed labels "Brésil - Rio Grande do Sul, Dr. Ihering 614 - 16". The remaining one male and two females have green printed labels "Brésil, Rio G. d. Sul,

Ihering".

The first-mentioned specimens with the white locality labels appear to be older, and some of them have their wings spread. In 1966 I labeled one of these males as hololectotype, and I here designate it as such. The remaining four males and five females are very probably paratypes. One of these paratypes was then dissected and drawings of its genitalia made. Measurements of the length of the insects given in Pictet and Saussure (1887: 357) seem to refer to the length from fastigium to end of tegmina (not to end of abdomen). There are also in GÈNEVE one male and two females labeled "Santa Catarina, Fruhstorfer" also identified as *Zoniopoda iheringi*. The identification labels in these specimens are written in a different hand from the above, and they are probably not paratypes, but specimens obtained after the original description was made.

In their description of *Zoniopoda iheringi*, Pictet and Saussure state that its wings are lilac-blue ("d'un bleu un peu lilas"). I have examined a number of specimens of this species and have verified that the color of the hind wings varies with the geographical origin of the specimens. In the cases examined, it was found that all the specimens from Uruguay and from the Brazilian states of Rio Grande do Sul, Santa Catarina and Mato Grosso, had bluish wings, while all specimens from the states of São Paulo and Minas Gerais (Brasil) had reddish-pink wings. A similar case is described for *Zoniopoda hempeli* (see above). Other romaleids, such as *Chromacris speciosa* (Thunberg), also may have hind wings of different colors, either orange or yellow, even within the same population (Roberts & Carbonell 1982: 47).

The locale of this species is indicated in the original description as Southern Brasil (Brèsil Méridional). Rehn (1905: 38, 1907:174) mentions it for Sapucay (Dept. of Paraguarí in E Paraguay), and later (1913: 333, 1915: 284) for the Province of Misiones in Argentina. Bruner (1906: 653) gives it for Sapucay, and later (1911: 55) for Chapada dos Guimarães in Mato Grosso, Brasil, and (1913: 471) for Santa Cruz de la Sierra in Bolivia. I have not critically examined the voucher specimens of the above authors, and the similarity of this species with others in the genus points to the possibility of misidentifications. Such is the case for the Bolivian locality Santa Cruz de la Sierra: the specimens I have examined from this place are all *Z. hempeli*. *Z. iheringi* also occurs in most of the territory of Uruguay.

Specimens examined.— Besides those mentioned-above: BRASIL. State of Mato Grosso: Jaciara on BR 364, Jan 1972; Chapada dos Guimarães, Apr. State of Mato Grosso do Sul: Corumba-Urucum, Dec 1919. State of Goias: Campinas, Dec 1935. State of Minas Gerais: Serra de Caraça, Dec 1972; Poços de Caldas, Jan 1978. State of São Paulo: Ipiranga [now within City of São Paulo], Jan 1909, Dec 1910; Campos de Jordão, Dec 1925; Serra da Bocaina, Apr 1978; Santo Andre, Feb 1962; Lussanvira, Dec 1919. State of Santa Catarina: Papanduva, Feb 1987. State of Rio Grande do Sul: 10 km E of Aratinga, Feb 1964; Barro Vermelho, Feb 1964. ARGENTINA. Prov. Jujuy: City of Jujuy, Feb 1920. Prov. Salta: 7-38 km N of Ciudad de Salta, 1200-1400 m alt. Mar 1976. Prov. Entre Rios, Pronunciamiento, Feb-Mar 1964. URUGUAY. Dept. Artigas: Arroyo Tres Cruces Grande, curso medio, Feb 1955. Dept. Rivera: Cuchilla Negra, Jan 1954. Dept. Tacuarembó: Caraguatá, Jan 1956.

Zoniopoda juncorum Berg 1887

Zoniopoda juncorum Berg (in Pictet and Saussure 1887: 356) (description). Giglio-Tos 1894: 18 (distr.), 1895: 812 (distr.). Bruner 1900: 61 (ecol. distr.), 1906: 653 (distr.), 1911: 57 (in key). Kirby 1910: 376. Liebermann 1928: 148 (distr.), 1939: 180 (distr.),1941b: 157 (distr.), 1946: 454 (distr.), 1971a: 13 (distr.). Liebermann and Piran 1941: 10 (distr.). Mesa 1956: 35 (chromosomes). Passerin 1981: 43 (specimens in Giglio-Tos collection). Mesa *et al* 1983: 516 (chromosomes).

The type series of *Zoniopoda juncorum* is in GÈNEVE. There are three males and two females with their wings spread labeled "*Zoniopoda juncorum* Berg (Uruguay)". Some of these specimens are also marked "478, Ihering". In 1966 I marked the best-preserved male (both antennae lacking) as hololectotype, and I here designate it as such. There are also one male and one female with folded wings labeled "Buenos Aires", also part of the type series. In VIENNA there are three males and one female of this species, labeled "*Zoniopoda juncorum* Berg" "Banda Oriental del Uruguay, ded. Berg", that probably belong to the original type series and may be considered as paratypes. Banda Oriental del Uruguay is an old name for what is now the Republic of Uruguay.

This species is attributed to Pictet and Saussure by Kirby (1910) and some other authors. Even though published in Pictet and Saussure's (1887) "Catalogue d'Acridiens", Berg is clearly indicated in the text as the author of the species.

The specific name *juncorum* suggests that the species lives on rushes. Bruner (1900: 61) states this "insect has been reported only from swampy localities, where it occurs sparingly upon rushes growing in water". Mentions of this species in the literature are scarce. Giglio-Tos (1894, 1895, 1897) indicates it for the Argentine Provinces of Chaco and Jujuy, and also for Paraguay and southern Bolivia. Liebermann has it for Santa Fe (1928), and Salta (1971) in Argentina. The species has been found once in southern Uruguay, in a similar habitat.

Specimens examined.— Besides those in the type series: URUGUAY. 3 m., 3 f., Dept. Florida, Casupá, Jan 1955.

Zoniopoda mimicula Rehn 1909

Zoniopoda mimicula Rehn 1909: 132 (description). Bruner 1911: 57, 60 (in key of spp., distr.). Liebermann 1955: 337 (distr.).

Type of *Zoniopoda mimicula* Rehn 1909 is a male in WASHINGTON labeled "Chapada, Nov" "2108". Chapada dos Guimarães in Mato Grosso is the only locality mentioned for this species in the literature.

Geographical distribution.— According to the above, the species is known only from south-central Brasil, in an area that includes Mato Grosso, Mato Grosso do Sul and western Goias. The species appears to be rare.

Specimens examined.— Besides the ones mentioned above: BRASIL. State of Mato Grosso: Chapada dos Guimarães, Jan 1972; Gaucho on BR 163 [not found on maps, but located near Cuiaba]. State of Mato Grosso do Sul: Jaragua Dec 1936 [probably the small town of this name W of Campo Grande]; 15-35 km W of Aquidauana, Mar 1980. State of Goias: 15-30 km W of Jataí, Mar 1980.

Zoniopoda omnicolor (Blanchard 1843)

Acridium omnicolor Blanchard in d'Orbigny 1843(6): 216, pl.27, fig. 3 (description, illustr.).

Zoniopoda omnicolor; Giglio-Tos 1895: 812 (redescr.) ,1897: 29 (distr). Bruner 1900: 61 (synonymy with *Z. emarginata* Stål; distr. ecol.), 1906: 652, 653, 655 (in key, distr.), 1911: 58 (in key). Rehn 1905: 38 (distr.), 1907: 176 (distr.), 1913: 334 (distr.), 1915: 285 (distr.). Kirby 1910: 376. Liebermann 1928: 148 (distr.), 1939: 181 (distr.), 1941b: 157 (distr.), 1946: 453 (distr.),1948: 82 (distr.),1949a: 5 (distr.), 1950a: 135 (distr.), 1951: 43,46 (distr.), 1955: 337 (distr.), 1958: 9 (distr. ecol.), 1968: 45 (distr.), 1971a: 1991, 12, 13 (distr.),1971b: 79, 1972b: 197 (econ.). Hebard 1931: 273 (distr.). Rehn & Grant 1959: 259 (epiphallus illustr.). Viana 1942: 125 (ecol.). Barrera & Paganini 1975: 121 (distr. ecol. bionom.). Gangwere & Ronderos 1975:178 (food selection). Virla 1978: 115, 119 (mandibles, food-plants). Turk 1980: 126 (eggs). Passerin 1981: 37, 43 (specimens in Giglio-Tos collection). COPR 1982: 124 (distr. econ.). Mesa *et al* 1983: 516 (chromosomes). Costa & Jantsch 1999: 141 (distr. Brasil). Cigliano *et al* 2000: 88 (distr.). De Wysiecki *et al* 2000: 217, 219 (distr.).

Zoniopoda emarginata Stål 1873: 52 (description). Pictet & Saussure 1887: 356 (in key; redescr. distr.). Bruner 1900: 61 (jr. syn of *Z. omnicolor*), 1906: 655, fig. 3 in pl.37 (distr. illustr.), 1911: 57 (in key). Kirby 1910: 376. Liebermann 1928: 148 (as syn. of *Z. omnicolor*), 1948: 82 (as syn. of *Z. omnicolor*, distr.). Sjostedt 1933: 31 (type, illustr.).

Types of Acridium omnicolor.— There are in the PARIS collection one male and one female specimen with the labels "Mus. Paris, Province de Corrientes, d'Orbigny 1834" "44" "8067/34". According to Blanchard's description and figure, the holotype is the female specimen, which I labeled as such in 1966, marking the male specimen as paratype. There is also a series of specimens of this species labeled "Bolivia, Chiquitos, d'Orbigny 1834". (Chiquitos is a province in the SE of the Department of Santa Cruz in Bolivia; San José de Chiquitos is a town in this province.)

Type of Zoniopoda emarginata Stål 1873.— The single female type of this species is in STOCKHOLM with a locality label that reads "Santiago d'Estrella", very probably an error for Santiago del Estero in Argentina. It belongs to the same species as Blanchard's *Acridium omnicolor*.

Blanchard (1843: 216) describes *Acridium omnicolor*, to which he also gives a French common name, "criquet bigarré" (variegated grasshopper). He does not give the origin of his specimens even if, as indicated above, they are labeled as coming from the Province of Corrientes (Argentina). The female specimen is figured in his fig. 3 of plate 27. According to the locality label of the type specimens, the Argentinian Province of Corrientes, (probably the country surrounding the City of Corrientes) could be considered as the type locality of this species. As recorded in the first part of this work, there is the possibility that the type specimen was actually collected across the Parana River in the Province of Chaco, and not in Corrientes.

Giglio-Tos 1895: 812, corrects Blanchard's descripton of this species: Blanchard wrote "*elytris flavescentibus nigro-venosis*", while it should say "*elytris nigris, flavo-venosis*".

Bruner (1900: 61) indicates the species for Córdoba in Argentina, and says it: "appears to be the same one described by Stål as *Z. emarginata*". Later (1906: 655) he indicates that the insect is common in Cordoba "where it is found in colonies upon special food-plants", without any indication as to the identity of these food-plants. Rehn (1907: 175), with reference to specimens collected in Sapucay, Paraguay, indicates that this "series exhibit considerable variation in size, the males ranging in length of body from 29 to 37 mm, the females from 44 to 52". Liebermann (1958: 9) states that this species is common and abundant in the SE of the province of Formosa. COPR (1982: 124) gives a short redescription and a distribution map that includes the Bolivian Chaco, parts of the Brazilian states of Mato Grosso and Goias, most of Paraguay and the Argentinian provinces of Jujuy, Salta, Tucumán, Santiago del Estero, Chaco, Corrientes, Santa Fe, Córdoba and San Luis. Cigliano *et al*. (2000: 84, 86) mention this species as being present but scarce in the province of Buenos Aires (Pehuajó) and the eastern part of La Pampa (Santa Rosa and Toay), these being the southernmost localities hitherto recorded for the species and (together with *Z. tarsata*) for any species of the genus as well (parallel 36º 18'S).

Specimens examined.— BOLIVIA. Dept. Santa Cruz: nr City of Santa Cruz, 400 m alt., grassland, low shrubs, Feb 1976. PARAGUAY. Dept. Paraguarí: Sapucay, Mar 1965. Dept. Caaguazú: 40 km N of town of Caaguazú, Mar 1965. Dept. Guairá: Villarica, Dec 1921. Dept. Central: Luque, Mar 1965. ARGENTINA. Prov. Jujuy: City of Jujuy, Apr 1911. Prov. Formosa: City of Formosa, Dec 1917. Prov. Chaco: Resistencia, Feb 1965; Tapikolé, Dec 1925. Prov. Catamarca: N of prov. Road to El Rodeo, 1500 m alt. Mar 1979. Prov. Santiago del Estero: 50-80 km NW of La Banda, Mar 1979. Prov. Tucumán: El Cadillal, 500 m alt. Mar 1979. Prov. Córdoba: Calamuchita, Almafuerte Mar 1965; Cosquín, Mar 1920; El Manzano, Mar 1920. Prov. Santa Fe: Carcarañá, 1889.

Zoniopoda similis Bruner 1906

Zoniopoda similis Bruner 1906: 652 (description), 1911: 57 (in list of spp.). Rehn 1907: 174 (distr.), 1918: 203 (distr.). Kirby 1910: 376. Liebermann 1939: 181 (distr.). Muma 1952: 8 (paratypes in Nebraska). Rehn & Grant 1959: 259 (epiphallus illustr.). Mesa *et al* 1983: 516 (chromosomes). Costa & Jantsch 1999: 141 (distr.).

Types of Zoniopoda similis Bruner 1906.— In WASHINGTON, there is a female labeled "*Zoniopoda similis* Bruner Type" "Sapucay, Paraguay, W.T. Foster, Collector" "Mch". This specimen was probably intended as the holotype. It is badly discolored and blackened, now of a dark greenish color, but was probably light green when alive. Its antennae and hind legs are missing. There is also a male labeled as "Allotype" "Sapucay, Paraguay, W.T. Foster" "Mch." This specimen is somewhat better preserved than the female and keeps some of its original colors, especially the light-colored band along the pronotal dorsal carina, and the bright-red coloration of the hind tarsi. Genitalia of this specimen were dissected and found identical with that of specimens from the Brasilian state of Rio Grande do Sul in the MONTEVIDEO collection.

Geographical distibution.—Besides eastern Paraguay as indicated by the types, the distribution of this species according to the literature includes in Brasil:Chapada dos Guimarães in Mato Grosso (Bruner 1911: 59); Franca in the northeastern corner of the State of São Paulo (Rehn 1918: 203) and Rio Grande do Sul (Costa & Jantsch 1999: 141).

Specimens examined.— Besides the voucher specimens of the papers of Rehn and Bruner, specimens from: BOLIVIA. Dept. Santa Cruz: Prov. Ñuflo de Chavez, 500 m alt., Nov 1963. PARAGUAY. Dept Paraguarí: Sapucay, Feb-Mar 1905. BRASIL. State of Goias: 15-30 km E. of Mineiros Mar 1980; Jatai, Jan 1964. State of Mato Grosso: Chapada dos Guimarães, Nov, Jan 1972; 50 km S of Rondonopolis, Mar; Gaucho [not found on maps, but near city of Cuiaba]; BR 163, 100 km N of Campo Grande, Jan 1972. State of Mato Grosso do Sul: Urucum, Dec 1919; crossing of BR 167 and 263, Jan; BR 86, btw. Ponta Pora and Dourados, Feb 1972. State of São Paulo: Franca, Jan 1911. State of Rio Grande do Sul: Ronda Alta, Feb 1964.

Zoniopoda tarsata (Serville 1831)

Acridium tarsatum Serville 1831: 283 (descr. from "Brésil"), 1839: 668 (redescr.). Burmeister 1838: 634 (redescr. distr.). Charpentier 1842: Tab.22 (redescr. illustr.).

Acrydium tarsatum; Guérin-Méneville 1838: 339, 1844, fig. 9 in pl. 54.

Calacris tarsata; Walker 1870: 640.

Zoniopoda tarsata Stål 1873: 51 (redescr.). Bolivar 1884: 36 (redescr. measurements). Pictet & Saussure 1887: 356 (redescr. distr.). Giglio-Tos 1894: 18 (distr. in Argentina), 1895: 812 (distr.), 1897: 29 (distr.), 1900: 4 (distr.). Bruner 1900: 61 (distr. in Argentina, habitat, econ., illustr.), 1906: 652 (distr. Paraguay, habitat), 1911: 59 (distr.), 1919: 38 (distr. Bolivia). Petrunkevitsh & Guaita 1901: 292 (anat.). Rehn 1907: 174 (this sp. type of genus *Zoniopoda*), 1908: 16 (distr.), 1909: 134 (distr.), 1915: 284 (distr.), 1918: 202 (distr.). Kirby 1910: 375. Liebermann 1928: 148, 1939: 180 (distr.), 1941a: 131 (distr.), 1955: 337 (distr.), 1942: 26 (bionom. ecol.), 1968: 45 (distr.), 1971a: 11, 12, 13 (distr.), 1971b: 79 (common name), 1972a: 7 (distr.), 1972a: 7, 1972b: 194, 197 (econ.). Baucke 1954: 9 (distr. S.Brasil). Mesa 1956: 35 (chromosomes). Rehn & Grant 1959: 260 (only species in tribe Zoniopodini). Greathead 1963: 495 (natural enemies). Campodonico & Santoro 1971: 66, 67, 73, 74 (eggs, illustr.). Santoro & Caramés 1973: 198, 200, 206 (antennae). Bucher 1974: 52, 83 (distr). Gangwere & Ronderos 1975: 178 (food selection, mandibles). Barrera & Paganini 1975: 121 (distr. bionom.). Santoro 1976: 2 (bionom.). Barrera & Turk 1977: 180 (egg-laying, eggs). Cardoso & di Tomaso 1979: 56-75 (chromosomes). Passerin 1981: 35, 43, 48 (specimens in Giglio-Tos collection). COPR 1982: 125 (distr. econ. food plants). Mesa *et al* 1983: 516, 517 (chromosomes). Duranton *et al.*1987: 47 (distr. habitat, food plants). Bentos-Pereira & Lorier 1991: 633, 655 (habitat, form of hind tibiae); 1995: 195. Lange 1992: 66, 68 (pathol.). Sanchez & De Wysiecki 1993: 31, 33 (ecol.). Lange & De Wysiecki 1996: 26, 27 (pathol.). Costa & Jantsch 1999: 141 (distr. S.Brasil). Cigliano *et al.* 2000: 88 (distr. Argentina). De Wysiecki *et al* 2000: 217, 219 (distr.).

Acridium cruentatum Blanchard 1843: 216 (descr.).

Zoniopoda cruentata; Rehn 1907: 175 (*Z. cruentata* as a different sp. from *Z. tarsata*), 1913: 334, 1915: 285, 1918: 202 (distr., *Z. cruentata* probably a geographical race or environmental phase of *Z. tarsata*). Kirby 1910: 376. Bruner 1911: 59. Hebard 1931: 272 (distr.). Liebermann 1941a: 31, 1941b: 157, 1942: 26 (distr. ecol. life hist.), 1945: 236 (distr.). Liebermann & Piran 1941: 10 (distr.). Viana 1942: 125. Hepper 1945: 291-292 (habitat, stridulation, distr.). Blanchard, E.E. 1945: 4 (distr. in Argentina). Hayward 1960: 79 (econ.). Rehn & Grant 1959: 259 (in tribe Zoniopodini, epiphallus figured). Mason 1969: 279, 299 (tympanal organ). Barrera & Paganini 1975: 121 (bionom. ecol.).

Zoniopoda tarsata cruentata; Liebermann & Schiuma 1946: 21, 38 (econ.). Liebermann & Ruffinelli 1946: 12 (distr. econ.). Liebermann 1948: 82 (distr.), 1949a: 4 (distr.), 1949b: 14, 1950: 9-10 (distr.), 1951: 43-46 (distr.), 1954: 7 (distr.), 1958: 10 (distr.), 1967: 107, 1968: 45 (distr.). Baucke 1954: 9 (distr.). Schiuma 1951: 15 (food-plants). Podtiaguin 1953: 191 (ecol.). Silveira *et al.* 1958: 398 (anat. ecol. econ.). Greathead 1963: 495 (insect enemies).

The synonymy of *Acridium tarsatum* Serville 1831 and *A. cruentatum* Blanchard 1845 is apparently indicated for the first time by Bruner (1906: 652). Later Rehn (1918: 202) states that *Z. cruentata* is probably a subspecies or a cromatomorph of *Z. tarsata*. As seen above, from 1946 to 1963 a number of authors considered *cruentata* as a subspecies of *tarsata*, but in the light of present knowledge the differences between these two "forms" are better considered as intraspecific variation.

J.G. Audinet-Serville 1831: 283, makes a good description of *Acridium tarsatum*, based on male and female specimens from "Brésil" (without indication of a precise locality). According to my notes taken in PARIS, there is in the collection a single female without any label on the pin, but with one by its side, in the bottom of the box reading "*A. tarsatum* Serv. Brésil". This specimen coincides with the original measurements and description and was marked as type in 1966. It is here considered to be the holotype of the species. The measurements given with the description ("22 lignes, élytres comprises" = 49.5 mm) corresponds to a female, males being smaller. The male mentioned by Serville was not found in PARIS. The same author (Serville 1839: 668) redescribes this species later, giving it, besides its latin name, a French one "Criquet tarses rouges" (grasshopper with red tarsi). This redescription is more detailed than the first one. Serville refers again to female and male specimens, giving measurements for both: "Long. 20 lignes, femelle. Mâle 15 lignes", *i.e.* 45 mm for the female and 33.75 mm for the male. Both measurements are well within the range of the series examined for this work. If the new measurement given there for the female was taken in the same specimen referred to in the paper of 1831, it may be surmised that the 1839 measurement refers to the length from fastigium to end of abdomen, not to wing tips as the 1831 one. The male here described is said to come, like the female, from "Brésil".

E. Blanchard describes *Acridium cruentatum*, the "Criquet ensanglanté" (blood-stained grasshopper), in p. 216 of Alcide d'Orbigny's "Voyage dans l'Amérique Méridionale". His figure 5 in plate 27 is a good colored illustration of the male of the species. His Latin description of the species is very short, but the figure leaves no doubt as to its identity. Blanchard gives the size of the specimen as 30-35 mm in length with 60-56 mm wingspread.

The type of *Acridium cruentatum* is also in PARIS. I found there a male specimen with the wings of both sides spread. It had two labels: "Mus. Paris, Rio de Janeiro, d'Orbigny1834" and "8097/34". It was evidently the specimen from which the figure in Blanchard's paper of 1843 was made, and its measurements coincide with those given by Blanchard in his description. I labeled it as holotype of this species. The colored bands of leg pairs 1 and 2 are red, not yellow as shown in the figure in Blanchard's paper. Another male with identical data as the one above was labeled as paratype. These

specimens belong to the same species as the holotype of *Acridium tarsatum* Serville. Charpentier (1845: pl 22) gives excellent colored illustrations of the male and female of this species, and redescribes it in Latin and German. Stål (1873: 51) places the species in his new genus *Zoniopoda* and gives a short Latin description.

Giglio-Tos (1894: 18) indicates this species for the provinces of Buenos Aires, Salta and Chaco in Argentina and later (1895: 812) for Paraguay, and (1987: 29) for the Argentinian province of Jujuy and the Bolivian Chaco. Bruner (1906: 652) states that this species is "exceedingly common in Argentina, Brazil, Bolivia and Uruguay as well, where it is the prevalent species of the genus". As to its distribution within Brasil, the first concrete locality is given by Giglio-Tos (1900: 4) as Corumbá (in what is now the State of Mato Grosso do Sul at the border of Bolivia). Bruner (1911: 59) indicates it for Rio de Janeiro, Rehn (1908: 16) for Jundiaí in State of São Paulo.

Specimens examined.— About 250 specimens from the following places: BOLIVIA. Dept. Santa Cruz: Provincia Sara, [now called Prov. Gutiérrez] 400 m alt. Jan Feb 1922; near Samaipata, 1600 m alt. Feb 1976. Dept. La Paz: btw. Carnavi and Santa Ana 1100 m alt. Jan 1976. BRASIL. State of Mato Grosso do Sul: Corumba-Urucum, Dec 1919. State of Minas Gerais: Serra do Caraça, Mar 1972. State of Rio de Janeiro: City of Rio de Janeiro, Apr 1916; Floresta de Tijuca, March 1978. State of São Paulo: Jundiai, Jan 1899; Lussanvira, Dec 1919. State of Santa Catarina: Nova Teutonia, 300-500 m alt. Feb 1952. State of Rio Grande do Sul: Nonoai, Feb 1964. ARGENTINA. Prov. Jujuy: City of Jujuy, Apr 1911, Feb 1920. Prov. Salta: Tartagal, Jan 1965; Carahuasi, 140 km S of City of Salta, Feb 1965; 7- 38 km. N of Ciudad de Salta, 1200-1400 m alt. Mar 1976. Prov. Catamarca: Charqueadero River, near Aconquija, Mar 1973. Prov. Tucumán: Ciudad de Tucumán, Jan 1928; El Cadillal, 500 m.alt. Mar 1979. Prov. Formosa: City of Formosa, Dec 1917. Prov. Misiones: Dec. 1909. Prov. Chaco: Tapikolé, Dec 1925. Prov. Mendoza: Chacras de Coria, Jan 1907; City of Mendoza, 767 m alt. Apr 1908. Prov Córdoba: Cosquin, Mar 1920; General Paz; La Cumbre; El Manzano; Calamuchita; La Carlota, Ciudad de Córdoba. Prov. Santa Fe: Ceres, Feb 1939; Carcarañá, Feb 1899. Prov. Entre Rios: Pronunciamiento, Mch-Apr 1964. Prov. Buenos Aires: 82 km SE of Pergamino, Feb 1974; Tigre, Feb 1920. PARAGUAY. Dept. Paraguarí: Sapucay, Mar 1965. URUGUAY. Dept. Artigas: Arroyo Sepulturas, Jan 1905, Feb 1906. Dept. Rivera: Cuchilla Negra, Jan 1954. Dept. Cerro Largo: Jan 1956. Dept. Tacuarembó: upper course of Arroyo Laureles, Mar 1960. Dept. Florida: Casupá, Jun 1955.

APPENDIX II. Tables of measurements.

Table 1. *Zoniopoda exilipes* Bruner. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. #953, PARAGUAY. Sapucay. #954, BRASIL. Goias, Jatai.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	953	41.2	39.2	4.0	3.0	7.0	11.4	31.0	17.1	16.5	3.0	1.8	17.0	2.1	6.0	5.9	2.9	11	11
m	954	37.4	35.3	3.6	3.1	6.7	10.7	28.1	15.6	14.8	2.6	1.7	---	2.0	5.8	5.6	2.6	11	11

Table 2. *Zoniopoda fissicauda* Bruner. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 955, BRASIL, Mato Grosso, N of Rio Verde. 956, 957, Mato Grosso do Sul, N of Campo Grande.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	955	31.4	27.6	2.6	2.4	5.0	8.2	24.3	14.5	13.2	2.2	1.5	15.4	1.1	4.6	4.4	2.2	11	12
m	956	38.3	35.2	3.3	3.0	6.3	9.8	29.7	17.6	16.0	2.6	1.7	19.8	1.6	5.5	5.1	2.5	11	11
f	957	46.9	41.3	4.3	4.4	8.7	13.0	38.1	22.6	21.6	2.8	2.0	---	2.2	7.4	6.0	3.2	11	11

Table 3. *Zoniopoda hempeli* Bruner. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 890, 891, 895, 896, BRASIL, Rio Grande do Sul, Nonoai. 892, 897, PARAGUAY, Sapucay. 893, BRASIL, Minas Gerais, Poços de Caldas. 894, 899, BOLIVIA, Santa Cruz, Naranjales. 898, BRASIL, Rio Grande do Sul, Barro Vermelho.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	890	31.5	28.6	2.7	3.2	5.9	9.1	24.5	13.8	12.9	2.3	1.5	15.5	1.4	4.7	4.7	2.1	11	12
m	891	32.2	28.9	2.8	3.4	6.2	9.3	24.7	14.2	13.0	2.2	1.6	15.4	1.5	4.8	4.8	2.3	11	12
m	892	32.9	29.5	3.1	3.5	6.6	9.9	24.6	15.6	14.3	2.5	1.8	16.8	1.6	4.7	5.0	2.5	11	12
m	893	33.0	26.8	3.0	3.5	6.5	9.6	25.3	14.2	13.5	2.3	1.7	15.0	1.7	5.4	4.9	2.5	11	11
m	894	36.8	30.2	3.2	3.7	6.9	9.7	28.8	17.3	16.6	2.5	1.6	---	1.5	5.5	5.2	2.7	11	10
f	895	39.0	36.3	3.5	4.1	7.6	11.2	29.8	16.2	15.0	2.2	1.6	14.3	2.3	5.7	5.5	2.8	11	11
f	896	41.0	36.2	3.6	4.8	8.4	11.5	31.2	19.0	18.2	2.5	1.6	15.4	2.1	6.8	5.7	2.9	11	10
f	897	45.8	38.0	4.0	4.9	8.9	13.0	33.5	19.9	17.9	2.9	2.0	18.2	2.5	7.2	6.5	3.4	11	11
f	898	47.7	40.9	4.6	5.9	10.5	14.1	36.6	22.5	21.4	2.9	2.0	---	2.2	7.4	6.2	3.4	12	14
f	899	45.9	41.3	4.6	5.4	10.0	13.7	34.8	21.7	19.9	2.8	1.9	16.5	2.5	7.9	6.4	3.3	11	11

Table 4. *Zoniopoda iheringi* Pictet & Saussure. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 922, 928, URUGUAY, Artigas, Arroyo Tres Cruces. 923, 931, URUGUAY, Tacuarembó, Caraguatá. 925, BRASIL, Minas Gerais, Serra de Caraça. 926, BRASIL, Santa Catarina, Papanduva. 927, BRASIL, São Paulo, Santo André. 929, URUGUAY, Lavalleja Rio Cebollatí Picada Rodríguez. 932, BRASIL, Rio Grande do Sul, E. of Aratinga.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	922	35.7	28.5	3.1	3.9	7.0	9.3	27.8	15.1	14.1	2.3	1.5	16.2	1.2	4.9	4.5	2.5	12	14
m	923	34.8	30.1	3.1	3.8	6.9	9.7	27.4	16.0	15.5	2.4	1.6	15.5	1.2	4.9	4.6	2.6	12	12
m	925	32.8	29.0	2.9	3.4	6.3	9.1	25.3	15.2	13.0	2.2	1.6	16.2	1.3	4.9	4.6	2.5	11	11
m	926	34.8	28.3	3.3	3.5	6.8	9.4	27.5	16.1	15.2	2.3	1.7	---	1.3	5.2	4.8	2.3	12	13
m	927	32.5	29.2	3.1	3.8	6.9	9.9	25.1	15.7	14.5	2.4	1.7	13.7	1.5	5.1	4.8	2.5	11	12
f	928	44.0	42.4	4.0	5.5	9.5	13.2	33.3	21.3	20.4	2.8	2.0	17.1	2.1	6.8	5.9	3.2	13	17
f	929	50.2	43.1	4.2	6.3	10.5	14.7	38.9	23.1	23.0	3.0	2.0	---	2.3	7.9	6.4	3.6	12	13
f	931	47.9	42.3	4.2	5.9	10.1	14.3	35.1	23.4	23.1	2.9	1.9	15.5	2.1	7.4	6.2	3.5	12	13
f	932	45.9	40.0	4.7	5.5	10.2	14.3	34.5	23.0	21.9	3.0	1.9	---	2.3	7.5	6.3	3.5	12	14

Table 5. *Zoniopoda juncorum* Berg. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 917, 918, 919, 920, URUGUAY, Florida, Casupá.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	917	45.1	39.4	4.0	4.8	8.8	12.1	35.4	20.3	18.7	2.5	1.5	18.7	1.4	6.8	4.6	3.1	10	12
f	918	54.2	47.3	5.0	6.5	11.5	15.5	42.0	24.7	22.6	3.0	1.7	18.5	2.0	8.8	5.8	3.9	11	12
f	919	61.0	49.5	5.7	7.3	13.0	17.9	47.9	27.3	25.5	3.1	1.7	---	2.1	10.0	6.1	4.2	11	11
f	920	58.7	50.5	6.0	7.6	13.6	18.0	45.4	28.2	26.1	3.0	1.7	---	2.2	10.0	5.7	4.3	11	12

Table 6. *Zoniopoda mimicula* Rehn. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 912, 913, 915, 916 BRASIL, Mato Grosso, Chapada dos Guimarães. 914, BRASIL, Mato Grosso, Jaraguá.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	912	31.0	28.8	3.1	3.0	6.1	9.4	23.1	14.4	13.2	2.3	1.6	14.0	1.2	4.7	4.6	2.4	11	11
m	913	31.3	28.6	3.2	2.9	6.1	9.1	23.9	14.0	13.1	2.4	1.6	14.6	1.3	5.1	4.6	2.5	11	11
m	914	35.3	29.8	3.3	3.4	6.7	9.8	26.9	16.0	14.5	2.5	1.6	16.2	1.3	4.8	4.6	2.5	11	11
m	915	30.6	28.7	2.8	2.7	5.5	8.6	23.5	14.2	13.0	2.2	1.6	14.3	1.2	4.6	4.3	2.4	11	11
f	916	37.8	36.0	4.0	4.0	8.0	11.9	27.4	18.6	15.5	2.7	1.8	15.8	1.8	6.3	5.4	3.0	11	11

Table 7. *Zoniopoda omnicolor* Blanchard. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 944, 945, 946, PARAGUAY, Sapucay. 947, PARAGUAY, 40 km N of Caaguazú. 948, PARAGUAY, Central, Luque. 949, ARGENTINA, Chaco, Resistencia. 957, ARGENTINA, Formosa.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	944	36.1	31.7	3.2	3.0	6.2	10.2	27.2	16.1	15.5	2.6	1.9	---	1.5	5.6	5.4	2.7	11	11
m	945	39.2	35.2	3.4	3.2	6.6	10.8	29.6	17.0	14.3	2.5	1.8	---	1.6	5.9	5.2	3.0	11	11
m	946	40.4	35.9	3.6	3.5	7.1	11.2	30.0	17.3	17.0	2.6	1.8	19.4	1.6	6.2	5.4	3.2	11	11
m	947	39.0	36.6	3.4	3.5	6.9	11.1	28.8	17.2	16.6	2.7	1.8	18.5	1.6	6.3	5.4	3.1	11	11
m	957	39.9	35.5	3.6	3.7	7.3	11.6	30.4	17.3	16.6	2.7	1.8	16.6	1.8	6.1	5.6	3.4	10	11
f	948	41.8	48.0	5.0	4.6	9.6	15.8	28.0	21.2	20.7	3.3	2.1	19.8	2.8	9.0	7.2	3.8	11	11
f	949	38.4	46.5	4.9	4.1	9.0	14.5	25.2	20.8	19.8	3.1	2.2	18.1	2.6	8.2	6.9	3.8	11	11

Table 8. *Zoniopoda danottei* n. sp. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female; **h,** holotype; **p**, paratype. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 950, 951, 952, BRASIL, Distrito Federal, NE of Brasilia.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
mh	950	38.0	32.2	3.2	3.8	7.0	10.0	29.7	16.3	15.7	2.5	1.8	18.9	1.5	5.9	5.3	2.6	11	11
f p	951	43.4	42.6	4.1	5.0	9.1	13.0	32.3	20.7	19.9	2.8	1.7	20.0	2.3	7.7	6.2	3.3	10	11
f p	952	46.7	48.1	4.5	4.9	9.4	13.7	35.3	21.7	20.1	2.9	2.0	24.0	2.2	8.0	6.5	3.4	11	11

Table 9. *Zoniopoda similis* Bruner. Measurements (mm). **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C,** prozona; **D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 900, 901, 902, 903, 906, 907, BRASIL, Rio G. do Sul, Ronda Alta. 904, BRASIL, Goias, Jataí. 908, BRASIL, Mato Grosso do Sul, BRs 163 and 267. 909, BRASIL, Mato Grosso, Chapada dos Guimarães. 910, BRASIL, Mato Grosso do Sul, Ponta Porá - Dourados. 911, BRASIL, São Paulo, Itirapina, Represa do Lobo.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	900	34.7	30.7	3.3	3.0	6.3	9.8	32.7	15.2	13.8	2.5	1.6	14.9	1.3	4.5	48	2.3	11	12
m	901	34.3	31.1	3.2	3.0	6.2	9.6	26.4	14.9	13.3	2.4	1.6	---	1.6	4.5	4.5	2.2	11	9
m	902	37.2	32.1	3.1	3.4	6.5	9.8	29.0	16.0	14.3	2.3	1.7	14.5	1.5	4.5	4.6	2.4	11	11
m	903	35.9	32.2	3.4	3.2	6.6	9.8	27.6	15.9	14.2	2.4	1.7	16.0	1.5	4.8	4.7	2.4	11	12
m	904	31.2	27.1	3.0	2.7	5.7	8.7	23.8	13.7	12.7	2.4	1.6	17.0	1.2	4.3	4.4	2.2	11	10
m	910	36.5	32.6	3.3	3.0	6.3	10.0	27.8	15.6	14.1	2.5	1.6	---	1.5	4.6	4.9	2.3	11	10
m	911	35.1	33.0	3.5	3.0	6.5	10.1	26.6	16.0	14.4	2.5	1.7	17.4	1.6	4.9	4.9	2.5	10	11
f	905	50.5	43.5	4.2	4.8	9.0	13.1	39.0	21.5	19.2	2.8	1.8	---	2.3	6.5	5.9	3.2	11	11
f	906	44.7	38.5	3.8	4.0	7.8	11.7	33.9	20.2	18.9	2.5	1.7	---	2.0	6.2	5.7	3.0	11	9
f	907	46.8	41.6	4.0	4.3	8.3	12.7	35.9	20.0	16.1	2.8	1.8	16.5	2.2	6.1	5.8	3.0	11	10
f	908	47.2	42.5	4.0	4.8	8.8	13.6	35.9	21.0	19.0	2.8	1.8	---	2.1	6.7	5.9	3.3	11	10
f	909	41.9	38.1	3.9	4.6	8.5	12.4	31.3	19.1	17.1	2.8	1.8	16.1	1.8	6.4	5.6	2.7	11	11

Table 10. *Zoniopoda tarsata* Serville. Measurements. **Sx,** sex; **#,** specimen number; **m,** male; **f,** female. **A - L, lengths** (mm)**: A,** frons to end of tegmen; **B,** frons to end of abdomen; **C, D,** metazona; **E,** pronotum; **F,** head + pronotum; **G,** tegmen; **H,** hind femur; **I,** hind tibia; **J,** eye, max.; **K,** eye, min.; **L,** antenna. **M-P, widths** (mm)**: M,** interocular; **N,** pronotum; **O,** head at eyes; **P,** hind femur. **Q,** spines hind tibia, internal; **R,** same, external. 933, URUGUAY, Florida, Casupá. 934, 942, 943, ARGENTINA, Salta, Carahuasi. 935, 939, BRASIL, Rio de Janeiro. 936, 938, BRASIL, Rio de Janeiro, Floresta de Tijuca. 937, URUGUAY, Cerro Largo. 940, PARAGUAY, Sapucay. 941, URUGUAY, Tacuarembó, Arroyo Laureles.

S_x	#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
m	933	37.8	36.4	3.4	3.7	7.1	10.4	29.6	19.2	17.8	2.6	1.7	17.8	1.5	5.6	5.0	2.9	10	9
m	934	36.7	32.8	3.1	3.1	6.2	9.6	28.7	16.3	15.5	2.6	1.8	16.0	1.5	5.3	5.0	2.7	11	10
m	935	37.4	33.3	3.3	3.3	6.6	9.7	28.3	16.7	16.5	2.6	1.8	---	1.5	5.4	5.1	2.6	12	11
m	936	36.8	31.6	3.1	3.1	6.2	9.8	28.5	15.6	15.3	2.4	1.8	---	1.5	5.3	5.0	2.7	11	11
m	937	37.1	30.0	3.1	3.1	6.2	9.5	29.1	16.5	16.0	2.5	1.8	---	1.3	5.1	5.0	2.6	11	10
m	943	38.0	31.3	3.2	3.4	6.6	10.0	29.3	16.8	15.8	2.3	1.6	16.8	1.5	5.6	4.7	2.5	11	8
f	938	48.0	44.8	4.9	4.9	9.8	14.3	37.0	22.8	21.6	2.8	2.1	---	2.4	8.1	6.5	3.5	12	11
f	939	47.8	40.7	4.5	4.6	9.1	13.3	36.8	22.4	21.1	2.9	2.0	19.6	2.3	8.2	6.3	3.5	10	11
f	940	44.9	41.9	4.0	4.5	8.5	12.4	33.9	20.0	18.9	3.1	2.1	16.8	2.0	6.9	6.2	3.3	11	11
f	941	48.5	44.5	4.5	5.1	9.6	14.0	36.9	22.3	21.5	3.0	20	17.8	2.1	7.8	6.3	3.1	11	12
f	942	47.5	50.4	4.8	4.9	9.7	14.0	35.6	22.0	21.0	3.0	19	17.6	2.3	8.1	6.4	3.4	11	10

Appendix III. Approximate coordinates of the localities mentioned in the text.

	Latitude	Longitude
ARGENTINA		
Prov. Buenos Aires		
Pehuajó	35° 58′S	61° 50′W
Pergamino SE of)	34° 28′S	60° 05′W
Tigre	34° 26′S	58° 35′W
Prov. Catamarca		
El Rodeo	28° 13′S	65° 58′W
Prov. Chaco		
Resistencia	27° 27′S	59° 00′W
Charqueadero	27° 20′S	65° 58′W
Prov. Córdoba		
Almafuerte	32° 13′S	64° 15′W
Ciudad de Córdoba	31° 22′S	64° 10′W
Cosquín	31° 16′S	64° 28′W
El Manzano	31° 05′S	64° 18′W
General Paz	31° 08′S	64° 09′W
La Carlota	33° 25′S	63° 18′W
La Cumbre	30° 59′S	64° 29′W
Prov. Corrientes		
Corrientes (Ciudad)	27° 25′S	58° 44′W
Prov. Entre Rios		
Pronunciamiento	32° 21′S	58° 26′W
Prov. Formosa		
Formosa (Ciudad)	26° 09′S	58° 11′W
Tapicolé	not found	
Prov. Jujuy		
Jujuy (Ciudad)	24° 12′S	65° 18′W
Prov. La Pampa		
Santa Rosa	36° 15′S	64° 05′W
Toay	36° 18′S	64° 06′W
Prov. Mendoza		
Chacras de Coria	33° 00′S	68° 52′W
Mendoza (Ciudad)	32° 54′S	68° 50′W
Prov. Salta		
Carahuasi	26° 00′S	65° 45′W
Salta (N of Ciudad)	24° 31′S	65° 21′W
Tartagal	22° 33′S	63° 47′W
Prov. Santa Fe		
Carcarañá	32° 52′S	61° 10′W
Ceres	29° 53′S	61° 57′W
Prov. Santiago del Estero		
La Banda (NW of)	27° 30′S	63° 45′W
Sgo. del Estero (Ciudad)	27° 50′S	64° 15′W
Prov. Tucumán		
El Cadillal	26° 41′S	65° 16′W
Tucuman (Ciudad)	26° 47′S	65° 15′W
BOLIVIA		
Dept. Santa Cruz		
Sta. Cruz de la Sierra	17° 47′S	63° 10′W
Sta. C. de la S. (SW of)	17° 53′S	63° 19′W
San José de Chiquitos	17° 50′S	60° 45′W
Buena Vista - San Carlos	17° 26′S	63° 43′W
BRASIL		
Distrito Federal		
Brasilia (center of)	15° 47′S	47° 55′W
State of Goias		
Campinas	not found	
Goias (town of)	15° 55′S	50° 06′W
Jataí	17° 53′S	51° 45′W
Jataí (10-30 km W of)	17° 53′S	51° 52′W
Mineiros (20 km E of)	17° 38′S	52° 20′W
State of Mato Grosso		
Chapada dos Guimarães	15° 27′S	55° 44′W
Cuiabá	15° 36′S	56° 06′W
Jaciara	15° 59′S	54° 57′W
Rondonopolis (50 km S of)	17° 02′S	54° 44′W
State of Mato Grosso do Sul		
Aquidauana (W of)	20° 27′S	55° 38′W
Campo Grande	20° 27′S	54° 37′W
Campo Grande (N of)	19° 31′S	54° 28′W
Corumbá	19° 10′S	57° 39′W
Crossing Rds. 163-267	21° 30′S	54° 15′W
Jaraguá	20° 27′S	54° 43′W
Gaucho	not found	
Nova Alborada	21° 30′S	54° 15′W
Ponta Porá - Dourados	22° 30′S	55° 15′W
Rio Verde	18° 55′S	54° 50′W
Urucum	19° 08′S	57° 38′W
State of Minas Gerais		
Itajubá	22° 30′S	45° 25′W
Itajubá (46 km SE of)	22° 30′S	45° 05′W
Serra Caraça (Coromandel)	18° 27′S	47° 06′W
Serra Caraça (Patos de M.)	18° 35′S	47° 13′W
Poços de Caldas	21° 48′S	46° 35′W
State of Rio de Janeiro		
Floresta de Tijuca	22° 55′S	43° 20′W
Itatiaia	22° 30′S	44° 33′W
Rio de Janeiro (City of)	22° 50′S	43° 18′W
State of Rio Grande do Sul		
Aratinga	29° 22′S	50° 10′W
Aratinga (10 km E of)	29° 22′S	50° 06′W
Barro Vermelho	30° 10′S	53° 11′W
Nonoai	27° 22′S	53° 29′W
Ronda Alta	27° 47′S	52° 49′W
Santo Augusto	27° 51′S	53° 47′W
State of Santa Catarina		
Nova Teutonia	27° 10′S	52° 21′W
State of São Paulo		
Campos de Jordão	22° 44′S	45° 35′W
Franca	20° 32′S	47° 23′W
Itirapina	22° 15′S	47° 50′W
Jundiaí	23° 12′S	46° 55′W
Lussanvira	20° 42′S	51° 10′W
Piraçununga	22° 00′S	47° 25′W
Rio Claro	22° 25′S	47° 33′W
Santo André	23° 33′S	46° 34′W
São Paulo (City of)	23° 30′S	46° 31′W
Serra da Bocaina	23° 30′S	46° 31′W
Serra Cantareira	23° 25′S	46° 35′W

	Latitude	Longitude
PARAGUAY		
Dept. Amambay		
Cerro Corá	22º 37'S	55º 59'W
Dept. Caaguazú		
Caaguazú (town of)	25º 28'S	56º 01'W
Caaguazú (40 km N of)	25º 08'S	58º 00'W
Dept. Central		
Luque	25º 17'S	57º 32'W
Dept. Guairá		
Villarica	25º 42'S	56º 25'W
Dept. Paraguarí		
Paraguarí (town of)	25º 38'S	57º 09'W
Sapucay	25º 40'S	56º 57'W
PERÚ		
Dept. Junín		
Chanchamayo (river)	11º 05'S	75º 18'W
URUGUAY		
Whole country from	30º 05'S	53º 11'W
to	35º 00'S	58º 26'W
Dept. Artigas		
Arroyo Tres Cruces Gr.	30º 20'S	56º 50'W
Arroyo Sepulturas	30º 50'S	56º 05'W
Dept. Cerro Largo		
(Capital of)	32º 22'S	54º 11'W
Dept. Florida		
Casupá	34º 02'S	55º 39'W
Dept. Tacuarembó		
Caraguatá	32º 15'S	55º 00'W

References

Barrera M., Paganini I.H. 1975. Acridios de Tucumán: notas bioecológicas. Acta Zoológica Lilloana 31: 107-124.

Barrera M., Turk S.Z. 1977. Acridios del NOA, II. Contribución al conocimiento de huevos, desoves y hábitos de postura de algunas especies de tucuras (Orthoptera, Acrididae), de la Provincia de Tucumán. Acta Zoologica Lilloana 32: 167-188.

Baucke O. 1954. Catalogo dos insetos encontrados no Rio Grande do Sul (Orthoptera, Acridoidea). Revista Agronomica, Porto Alegre 17(205-208): 2-11, pl. 1-7.

Bentos-Pereira A., Lorier E. 1991. Acridomorfos acuáticos (Orthoptera, Acridoidea). I. Adaptaciones morfológicas. Revista Brasileira de Entomologia 35: 631-653.

Bentos-Pereira A., Lorier E. 1995. Taxonomic value of the cuticular structures of the stomodeum in Acridomorpha. Journal of Orthoptera Research 4: 185-195.

Blanchard E. 1843. Insectes de l'Amerique Meridionale recuellis par Alcide d'Orbigny, pp.58-222 *in* D'Orbigny, Alcide, Voyage dans l'Ameriqe Meridionale, tome 6, part. 2, Insectes. Paris. 222 pp., 32 pl.

Blanchard E.E. y Colaboradores 1945. Insectos y nemátodos relacionados con el cultivo del tabaco. Ministerio de Agricultura, Instituto de Sanidad Vegetal, Argentina, Publicación Miscelánea Nº 1, (6) 23 pp.

Bolivar I. 1884. Insectos Neurópteros y Ortópteros. pp. 30-51, lam. 1-3 *in* Artrópodos del Viaje al Pacífico, verificado de de 1862 a 1865, por una comisión de Naturalistas enviada por el Gobierno Español. Madrid 115 pp.

Brown R.W. 1956. Composition of Scientific Words. Published by the author, Reese Press, Baltimore, 882 pp.

Bruner L. 1900. The second report of the Merchant's Locust Investigation Commission of Buenos Aires. Lincoln, Nebraska, 80 pp.

Bruner L. 1906. Synoptic list of Paraguayan Acrididae or Locusts, with descriptions of new forms. Proceedings of the United States National Museum 30: 613-694, pl. 36-38.

Bruner L. 1911. I. South American Acridoidea. Annals of the Carnegie Museum 8: 5-147.

Bruner L. 1913. South American Locusts (Acridoidea). II. Annals of the Carnegie Museum 8: 423-506.

Bruner L. 1919. Saltatorial Orthoptera from South America and the Isle of Pines. Annals of the Carnegie Museum 13: 5-91.

Brunner von Wattenwyl K. 1893. Révision du système des Orthoptères et description des espèces rapportés par M.Leonardo Fea de Birmanie. Annali del Museo Civico di Storia Naturale di Genova, ser. 2,13:5-230, lam. 1-6.

Bucher E.H. 1974. Observaciones ecológicas sobre los artrópodos del bosque chaqueño de Tucumán. Revista de la Facultad de Ciencias Exactas, Físicas y Naturales de Córdoba (Argentina), N.S., Biología 1: 35-122.

Burmeister H. 1838. Handbuch der Entomologie. Zweiter Band. Berlin 1050 pp.

Campodonico M.J., Santoro F.H. 1971. Identificación de acridios Orthoptera) por las esculturas del corion. Revista de Investigaciones Agropecuarias, Ser.5, Patología Vegetal, 8: 63-82.

Cardoso H., Di Tomaso M.V. 1979. Regiones heterocromáticas y organizadora nucleolar durante la meiosis de Zoniopoda tarsata (Orthoptera, Romaleidae). Mendeliana 4: 47-56.

Charpentier T. 1842 (1841-1845). Orthoptera descripta et depicta. Lipsiae, Text [unnumbered pages] + 60 pl.

Cigliano M.M., De Wysiecki M.L., Lange C.E. 2000. Grasshopper (Orthoptera: Acridoidea) species diversity in the Pampas, Argentina. Diversity and Distributions 6: 81-91.

C.O.P.R. 1982. The locust and grasshopper agricultural manual. Published by the Centre for Overseas Pest Research, London, vii + 690 pp.

Costa M.K.M.da, Jantsch L.J. 1999. Acridóideos (Orthoptera, Caelifera, Acridoidea) ocorrentes no Rio Grande do Sul. Biociêcias (Porto Alegre) 7(1):135-155.

De Wysiecki M.L., Sanchez N.E., Ricci S. 2000. Grassland and shrubland grasshopper community composition in northern La Pampa province, Argentina. Journal of Orthoptera Research 9: 211-221.

Dirsh V.M. 1956. The phallic complex in Acridoidea (Orthoptera) in relation to taxonomy. Transactions of the Royal Entomological Society of London 108: 223-356, 66 pl.

Dirsh V.M. 1961. A preliminary revision of the families and subfamilies of Acridoidea (Orthoptera, Insecta). Bulletin of the British Museum (N.H.) Entomology 10: 351-419.

Duranton J.F., Launois M., Launois-Luong M.H., Lecoq M. 1987. Guide practique de lutte contre les criquets ravageurs au Brésil. FAO-CIRAD/PRIFAS, Montpellier, 169 pp.

Gangwere S.K., Ronderos R.A. 1975. A synopsis of food selection in Argentine Acridoidea. Acrida 4: 173-194.

Giglio-Tos E. 1894. Viaggio dell dott. Alfredo Borelli nella Repubblica Argentina e nel Paraguay. VI, Ortotteri. Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Universita di Torino 9(184):1-46, 1 pl.

Giglio-Tos E. 1895. Ortotteri del Paraguay, racolti dal Dr. J.Bohls. Zoologischen Jahrbüchern, Jena 8: 804-818.

Giglio-Tos E. 1897. Viaggio del Dott. A. Borelli nel Chaco Boliviano e nella Republica Argentina. X, Ortotteri. Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Universita di Torino 12: 1-47.

Giglio-Tos E. 1898. Viaggio del Dr. Enrico Festa nella Republica dell'Ecuador e regioni vicine. VI, Ortotteri. Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Universitá di Torino 13: 1-108.

Giglio-Tos E. 1900. Viaggio del Dr. A. Borelli nel Matto Grosso en el Paraguay. IV, Ortotteri. Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Universitá di Torino 15: 1-8.

Greathead D.J. 1963. A review of the insect enemies of Acridoidea (Orthoptera). Transactions of the Royal Entomological Society of London 114: 437-517.

Hayward J.K. 1960. Insectos tucumanos perjudiciales. Revista Industrial y Agrícola de Tucumán 42: 3-144.

Hebard M. 1931. Die Ausbeute der deutschen Chaco-Expediton 1925/26. Orthoptera. Konowia. Zeitschrift für systematische Insektenkunde, Wien, 10: 257-285, pl.1.

Hepper H.C. 1945. Notas ecológicas, sistemáticas y zoogeográficas de acridios de la Argentina. Revista de la Sociedad Entomológica Argentina 12: 280-298, lams. 23-27.

Kirby W.F. 1910. A synonymic catalogue of Orthoptera. Vol. 3. Orthoptera Saltatoria. Part. 2. (Locustidae vel Acrididae). British Museum, London, 674 pp.

Lange C.E. 1992. Espectro hospedador natural y persistencia de Perezia dichroplusae y Nosema locustae (Protozoa: Microspora) en acridios argentinos (Orthoptera: Acrididae). Neotropica 38: 65-74.

Lange C.E., De Wysiecki M.L. 1996. The fate of Nosema locustae (Microsporida: Nosematidae) in Argentine grasshoppers (Orthoptera: Acrididae). Biological Control 7: 24-29.

Liebermann J. 1928. Preliminares para el estudio de los acridoideos argentinos. Anales de la Sociedad Científica Argentina 104: 137-158.

Liebermann J. 1939. Catálogo sistemático y biogeográfico de acridoideos argentinos. Revista de la Sociedad Entomológica Argentina 10: 125-230.

Liebermann J. 1941a. Contribución a la Zoogeografía, taxonomía y ecología de los acridoideos de Entre Rios. Publicación del Ministerio de Hacienda, Justicia e Instrucción Pública de Paraná, Entre Rios, 41 pp., 9 pl.

Liebermann J. 1941b. Lista de los acridoideos de la Provincia de Buenos Aires. Anuario Rural, Dirección de Agricultura Ganadería e Industrias, La Plata, 9: 155-158.

Liebermann J. 1942. Contribución al conocimiento de los acridios de San Luis. Boletín Agrícola, Mendoza, 1942 (10-12):1-36.

Liebermann J. 1945. Sobre una colección de acridios (Orth. Acrididae) del Instituto Miguel Lillo. Acta Zoologica Lilloana 3: 235-238.

Liebermann J. 1946. Sobre una colección de acridios paraguayos de la Misión Científica brasileña 1940-1944 (Orth. Acrid.). Revista de Entomología, Rio de Janeiro, 17: 452-456.

Liebermann J. 1947. Nuevos materiales acrídicos de la colección del Instituto Oswaldo Cruz con algunas observaciones acerca de *Episcopotettix* Rehn 1902. Revista Brasileira de Biologia 7: 391-394.

Liebermann J. 1948. Los acridios de Santa Fe. Revista de la Sociedad Entomológica Argentina 14: 56-114.

Liebermann J. 1949a. Sobre una colección de acridios argentinos del Naturhistorischen Museum de Viena (Orth. Acrid.). Instituto de Sanidad Vegetal, Buenos Aires, año 5, ser A, Nº 46, 12 pp.

Liebermann J. 1949b. Exploración acridiológica en Corrientes. IDIA, Buenos Aires, 15: 14-15.

Liebermann J. 1950a. Sobre una colección de acridoideos neotropicales del Dr. Richard Ebner, con la descripción del alotipo de *Diponthus bilineatus* Rehn (Orthoptera, Acridoidea). Revista Brasileira de Biologia, 10: 133-139.

Liebermann J. 1950b. Los acridios de San Juan. Instituto de Sanidad Vegetal, Buenos Aires, Año 6, Ser. A, Nº 50, 16 pp.

Liebermann J. 1951. Los acridios de Corrientes. IDIA, Buenos Aires, (42-43): 39-48.

Liebermann J. 1954. Los acridoideos de Catamarca y La Rioja. Instituto de Sanidad Vegetal, Buenos Aires, Año 10, Ser. A, Nº 58, 18 pp.

Liebermann J. 1955. Primeira relação sistemática dos acridoideos do Brasil. Memórias do Instituto Oswaldo Cruz 53: 329-344.

Liebermann J. 1958. Los acridios de Formosa (Orth. Caelif. Acridoidea). Instituto de Patología Vegetal, Buenos Aires, Año 1, Publicación Técnica Nº 5, 24 pp., 1 map.

Liebermann J. 1967. Contribución al conocimiento de las tucuras de La Pampa (Orth. Acrididae). Revista de la Sociedad Entomológica Argentina 29: 101-113.

Liebermann J. 1968. Sobre algunas colecciones de tucuras de la Provincia de Córdoba. IDIA, Buenos Aires, 251: 44-88.

Liebermann J. 1971a. Las tucuras de Salta. IDIA, Buenos Aires, 278: 10-14.

Liebermann J. 1971b. Sobre algunos nombres vulgares de ortópteros argentinos. IDIA, Buenos Aires, 283: 78-80.

Liebermann J. 1972a. Identificación de tucuras recolectadas en 1971 por el Ministerio de Agricultura de Santa Fe en el Departamento de San Jerónimo. IDIA, Buenos Aires, 290: 6-8.

Liebermann J. 1972b. The current state of the locust and grasshopper problem in Argentina. pp. 191-198 in Proceedings of the International Study Conference on Current and Future Problems of Acridiology, London 1970.

Liebermann J., Piran A.A. 1941. Primera lista de acridios uruguayos. Dirección General y de Contralor de la Lucha Contra la Langosta, Montevideo, 12 pp.

Liebermann J., Ruffinelli A. 1946. Catálogo de acridoideos uruguayos. Revista de la Asociación de Ingenieros Agrónomos, Montevideo, 74: 9-21.

Liebermann J., Schiuma R. 1946. Las tucuras mas perjudiciales de nuestra agricultura y ganadería. Publicaciones del Instituto de Sanidad Vegetal, Buenos Aires, Ser. B, Nº 7, 63 pp.

Mason J.B. 1969. The tympanal organ of Acridomorpha (Orthoptera). EOS, Madrid, 44: 267-355.

Mesa A. 1956. Los cromosomas de algunos acridoideos uruguayos (Orthoptera, Caelifera, Acridoidea). AGROS, Revista de la Asociación de Estudiantes de Agronomía, Montevideo, 141: 32-45.

Mesa A., Ferreira A., Carbonell C.S. 1983. Cariología de los acridoideos neotropicales: estado actual de su conocimiento y nuevas contribuciones. Annales de la Société Entomologique de France (N.S.) 18(1982): 507-526.

Muma M.H. 1952. Insect types in the collection of the University of Nebraska State Museum. Bulletin of the University of Nebraska State Museum 3: 1-35.

Otte D. 1978. The primary types of Orthoptera (Saltatoria, Mantodea, Phasmatodea and Blattodea) at the Academy of Natural Sciences of Philadelphia. Proceedings of the Academy of Natural Sciences of Philadelphia 130: 26-87.

Passerin D'Entreves P. 1981. Cataloghi. IV - Collezioni ortotterologiche del Museo di Zoologia dell'Universitá di Torino. Museo Regionale di Scienze Naturali, Torino, 127 pp.

Petrunkevitsh A., von Guaita G. 1901. Ueber den geschlechtlichen Dimorphismus bei den Tonapparaten der Orthopteren. Zoologische Jahrbücher, Jena, 14: 291-310, pl.15-18.

Pictet A., De Saussure H. 1887. Catalogue d'Acridiens. I. Bulletin de la Société Entomologique Suisse 7: 331-376.

Podtiaguin B. 1953. Síntesis de los estudios y observaciones llevadas a cabo en el Chaco Boreal Paraguayo, sobre la langosta *Schistocerca cancellata* (Serv.1839). Parte II. pp. 84-92 in Reunión Anual del CIPA en Porto Alegre, Brasil, 15-20 de setiembre de 1952.

Rehn J.A.G. 1905. Records of some Paraguayan Orthoptera, with the description of a new genus and species. Entomological News 16: 37-42.

Rehn J.A.G. 1907. Non-saltatorial and acridoid Orthoptera from Sapucay, Paraguay. Proceedings of the Academy of Natural Sciences of Philadelphia 59: 151-192.

Rehn J.A.G. 1908. Acrididae (Orthoptera) from Sao Paulo, Brazil, with descriptions of one new genus and three new species. Proceedings of the Academy of Natural Sciences of Philadelphia 60:12-23.

Rehn J.A.G. 1909. On Brazilian grasshopppers of the subfamilies Pyrgomorphinae and Locustinae (Acridinae of authors). Proceedings of the United States National Museum 36: 109-163.

Rehn J.A.G. 1913. A contribution to the knowledge of the Orthoptera of Argentina. Proceedings of the Academy of Natural Sciences of Philadelphia 63: 273-379.

Rehn J.A.G. 1915. A further contribution to the knowledge of the Orthoptera of Argentina. Proceedings of the Academy of Natural Sciences of Philadelphia 67: 270-292.

Rehn J.A.G. 1918. On Dermaptera and Orthoptera from Southeastern Brazil. Transactions of the American Entomological Society 44: 181-222.

Rehn J.A.G. 1920. Records and descriptions of Brazilian Orthoptera. Proceedings of the Academy of Natural Sciences of Philadelphia 72: 214-293, pl. 10-11.

Rehn J.A.G., Grant H.J. 1959. An analysis of the tribes of the Romaleinae with special reference to their internal genitalia (Orthoptera; Acrididae). Transactions of the American Entomological Society 85: 233-271.

Roberts H.R. 1941. A comparative study of the subfamilies of the Acrididae (Orthoptera) primarily on the basis of their phallic structures. Proceedings of the Academy of Natural Sciences of Philadelphia 93: 201-246.

Roberts H.R., Carbonell C.S. 1982. A revision of the grasshpper genera *Chromacris* and *Xestotrachelus* (Orthoptera, Romaleidae, Romaleinae). Proceedings of the California Academy of Sciences 43: 43-58.

Rowell C.H.F., Flook P.K. 1998. Phylogeny of the Caelifera and the Orthoptera as derived from ribosomal gene sequences. Journal of Orthoptera Research 7: 147-156.

Sanchez N.E., De WysieckiI M.L. 1993. Abundancia y diversidad de acridios (Orthoptera: Acrididae) en pasturas de la provincia de La Pampa, Argentina. Revista de Investigaciones Agropecuarias 24: 29-39.

Santoro F.H. 1976. Cálculo de la cantidad de estadios ninfales o de la edad, por el análisis de la antena del adulto o de los estadios inmaturos previos, en diversas especies de acridios. Revista de Investigaciones Agropecuarias, B. Aires, Ser.5, Patología Vegetal, 12: 1-6.

Santoro F.H., Caramés A.E. 1973. Antenitos que determinan las variaciones cuantitativas postembrionales en la antena de doce especies de acridios de la Argentina (Insecta, Orthoptera). Revista de Investigaciones Agropecuarias, Ser. 5, Patología Vegetal, 10: 197-209.

Schiuma R. 1951. Los estudios biológicos como base fundamental para la lucha contra la tucura. Ciencia e Investigación, Buenos Aires, 7: 10-15.

Serville J.G.Audinet. 1831. Revue methodique des insectes de l'Ordre des Orthoptères. Annales des Sciences Naturelles, Paris, 22:28-65, 134-167, 262-292. [Note: acridoids in pp 262-292.]

Serville J.G.Audinet. 1839. Histoire naturelle des insectes Orthoptères. Collection des suites a Buffon, Paris, xvii + 776 pp., Atlas, 4 pp., + 14 pl.

Silveira-Guido A., Carbonell-Brum J.F., Nuñez O., Valdes E. 1958. Investigaciones sobre acridoideos del Uruguay. Facultad de Agronomía, Montevideo, 485 pp.

Sjöstedt Y. 1933. Orthopterentypen im Naturhistorischen Reichsmuseum zu Stockholm. 2, Acrididae. Arkiv för Zoologi 24: 1-89, 20 pl.

Stål C. 1873. Recensio orthopterorum. Revue critique des Orthoptères décrits par Linné, De Geer et Thunberg. Norstedt and Söner, Stockholm, part 1, 154 pp.

Stål C. 1878. Systema Acridiodeorum. Essai d'une systematisation des acridoidées. Bihang till Kongliga Svenska Vetenskaps-Akademien Handlingar 5: 1-100.

Turk S.Z. 1980. Acridios del NOA. IV. Contribución al conocimiento de huevos, desoves y hábitos de postura de algunas especies de tucuras (Orthoptera, Acridoidea) de la Provincia de Tucumán. II. Acta zoologica Lilloana 36: 121-130

Uvarov B.P., Dirsh V.M. 1961. The diagnostic characters, scope and geographical distribution of the subfamily Romaleinae (Orthoptera: Acrididae). Proceedings of the Royal Entomological Society of London (B) 30: 153-160.

Viana, M.J. 1942. Observaciones sobre los Acrididae del Valle de Calamuchita, Córdoba. Ingeniería Agronómica, Buenos Aires, 20: 123-126.

Virla de Arguello N.E. 1978. Estudio de las mandíbulas y análisis de las heces en 15 especies de tucuras colectadas en los alfalfares de Córdoba (Rep. Arg.) Orthoptera, Acrididae). Revista de la Sociedad Entomológica Argentina 36: 113-123.

Walker F. 1870. Catalogue of the specimens of Dermaptera Saltatoria in the collection of the British Museum. British Museum (Natural History) London 3: 425-604, 4: 605-809, 5: 811-850.