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New Costa Rican species of the genus *Kritacris* (Acrididae, Proctolabinae)

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Abstract

Two new species, *K. dicronophallus* and *K. licrophallus*, are described from the Caribbean slope of Costa Rica, and new localities are given for *K. arboricola*, the type of the genus. The genus is redefined and a key provided. The three species differ principally in their phallic structures, external differences are minimal and confined to small differences in coloration and the female subgenital plate.

Key words

taxonomy, Central America, grasshoppers

Introduction

Kritacris arboricola Descamps, 1976, was first collected in the 1960s by insecticidal fogging of tree crowns in Costa Rica by H.R. Roberts, who published a description (1973: 63), but curiously did not then name it. Marius Descamps examined the unique holotype male and (1976:113) erected the genus *Kritacris* to contain it. The genus has remained monospecific until now.

Kritacris (Fig.1) is a rather small (*ca* 20 mm, see Table 1), slender, alate proctolabine, with long antennae, in form recalling the sympatric *Zosperamerus* Bruner, with which it also shares its foodplant, the secondary succession forest tree *Trema micrantha* (Ulmaceae). Whereas *Zosperamerus* is cryptic in mottled greens and yellows, *Kritacris* is relatively brightly colored, the head and pronotum being blackish with bright yellow markings, the thoracic pleura yellow green, and the legs bright leaf green. Most strikingly, the wings and the underlying proximal abdominal tergites (and sometimes the elytra too, especially in newly moulted individuals) are dark blue, an unusual color in this subfamily. As in many other apparently arboreal genera, specimens collected at ground level tend to be females, on their way to or from their terrestrial oviposition sites. (Several females have been found with the ovipositor valves heavily clogged with clay, leaving little doubt as to where they oviposit). Males are unfortunately rarely found.

The type locality (Finca la Selva, Sarapiquí, from which Descamps and Rowell (1984:154) also described the neallotype female) is in north Central Costa Rica, on the lowland Caribbean slope. *Kritacris* has since been found in several other Costa Rican localities: Amubri, Suretka and Cerro Uatsi, all in or overlooking the valley of the Rio Sixaola, which forms the south eastern border with Panama; Progreso in the nearby Valle de la Estrella, the valley north of the Sixaola; Tapantí, on the Eastern slopes of the Talamancas at the head of the basin of the Río Reventazón; and Bijagua de Rio Naranjo, near Upala by the Nicaraguan border. All these localities are in wet forest on the Caribbean slope. There is a single specimen (EMUS) from lowland Guanacaste, on the Pacific coast, from Taboga, near Cañas; however, its collector also collected extensively at Bijagua, and a labeling error is not completely excluded. Though probably not confined to Costa Rica, *Kritacris* has not yet been recorded from either Nicaragua or Panama. (see distribution map, Fig. 8)

Specimens from the different Costa Rican localities are all very similar, except for slight differences in coloration. However, among the three male specimens available to me, there is variation in the shape of the cercus; as this is a species-specific character in several proctolabine genera, such as, e.g., *Leioscapheus* and *Poecilocloeus*, I decided to examine the internal genitalia of the specimens in question. This examination has disclosed two new species, from Tapanti and Sixaola valley respectively, that differ considerably from *K. arboricola* in phallic structure. The genitalia of the Bijagua specimen proved to be identical with those of the Sarapiqui holotype of *arboricola*. As far as can be judged from the exclusively female specimens available, the Valle de Estrella form is also *K. arboricola*.

Within the subfamily Proctolabinae, there is a tendency to elongation and elaboration of the ventral aedeagal valves – this reaches its apogee in the genera *Balachowskyacris* and *Poecilocloeus*, where these structures form long coiled filaments up to several times the length of the remaining phallus. *Zosperamerus* shows an early stage of this progression – the ventral valve is tapered and undulant and about twice the length of the upper valve (Descamps 1976, his Fig. 156). *K. arboricola* has a less deviant structure – the lower valve is laterally flattened, tapered to a point and curved ventrally, but is about the same length as the upper valve, and the two ventral valves lie on either side of the (fused) dorsal valve (Descamps 1976, his Fig. 162, and Fig. 4A of this paper). In the two new species described below, the lower valves are elongated and branched, reaching a state similar to that seen in *Poecilocloeus fruticolus* (Descamps 1976, his Fig 221), and the extremities are bent upwards and lie dorsal to the dorsal valve. There are also changes in the size and shape of the fused upper aedeagal valve.

I also figure here the structure of female spermatheca of *Kritacris*, which has not been described previously – it conforms to the usual pattern for the subfamily.

Methods

Most of the specimens examined were collected by the author in Costa Rica at various times during the past 30 years; one is from the INBio (Instituto Nacional de Biodiversidad) collection. Normal taxonomic methods were employed; male and female internal

genitalia were dissected from relaxed specimens, macerated in 5% KOH, and stained as necessary in acid fuchsin. Measurements were obtained using a digital stage micrometer.

Abbreviations of depositories

MNHN	Museum National d'Histoire Naturelle, Paris
ANSP	Academy of Natural Sciences, Philadelphia
INBC	INBio, S. Domingo de Heredia, Costa Rica
EMUS	Entomological Museum, Utah S.U, Logan, Utah
RC	The author's collection.

Coordinates of collection localities are given according to the Costa Rican national map system (published by the Instituto Nacional Geográfico, San José). This uses two different grids, known as Lambert North (LN) and Lambert South (LS).

Results

Kritacris Descamps 1976

Redescription— Fastigium (Fig. 2) longer than wide, especially in the males, with a raised terminal carina. Interocular space very narrow, equal to or smaller than the diameter of the antennal flagellum. Antennae filiform and long, especially in the male, longer than head and pronotum combined. Frons in profile straight or slightly concave, receding. Eyes protuberant, globular. Prosternal process conical, blunt, mounted on a subquadrate pedestal. Mesosternal space subquadrate, wider than long. Pronotum with four sulci, three of which cross the midline. Medial pronotal carina present, but weak. Lateral carinae absent. Anterior margin of pronotum slightly incurved in midline. Posterior margin of pronotum entire, somewhat produced, rounded or very obtuse angulate. Elytra usually attain the base of the hind knees, but do not project beyond the ends of the knees, and are covered with a heavy reticulate venation. Dorsal carina of hind femur ends in a small spine at the knee. Upper lateral lobe of knee rounded, lower lobe short and roundly pointed. Seven external hind tibial spines, eight internal ones. Hind feet long, nearly half as long as the hind femur. Second tarsal joint of hind foot longer than the first one: foot formula 28:30:42.

Male: Posterior margin of 10th tergite usually with the suspicion of a small weak furcula (e.g., Fig. 3G). Male supra-anal plate (Fig. 3) characteristic, roughly oblong, longer than wide, with a triangular distal termination. The posterior corners of the oblong are produced upward and backwards as two small hornlike structures, and most of the supra-anal plate is melanized; only the proximal medial area is light colored and somewhat concave. Subgenital plate terminates in a pronounced triangular beak, and there are small membranous patches near the upper margin of the subgenital plate on each side. The pallium is coarse and thick and forms a cylindrical condom-like sheath containing the projecting aedeagal valves (Figs 3A, 4J). Paraprocts large, terminating in rounded cylindrical tips.

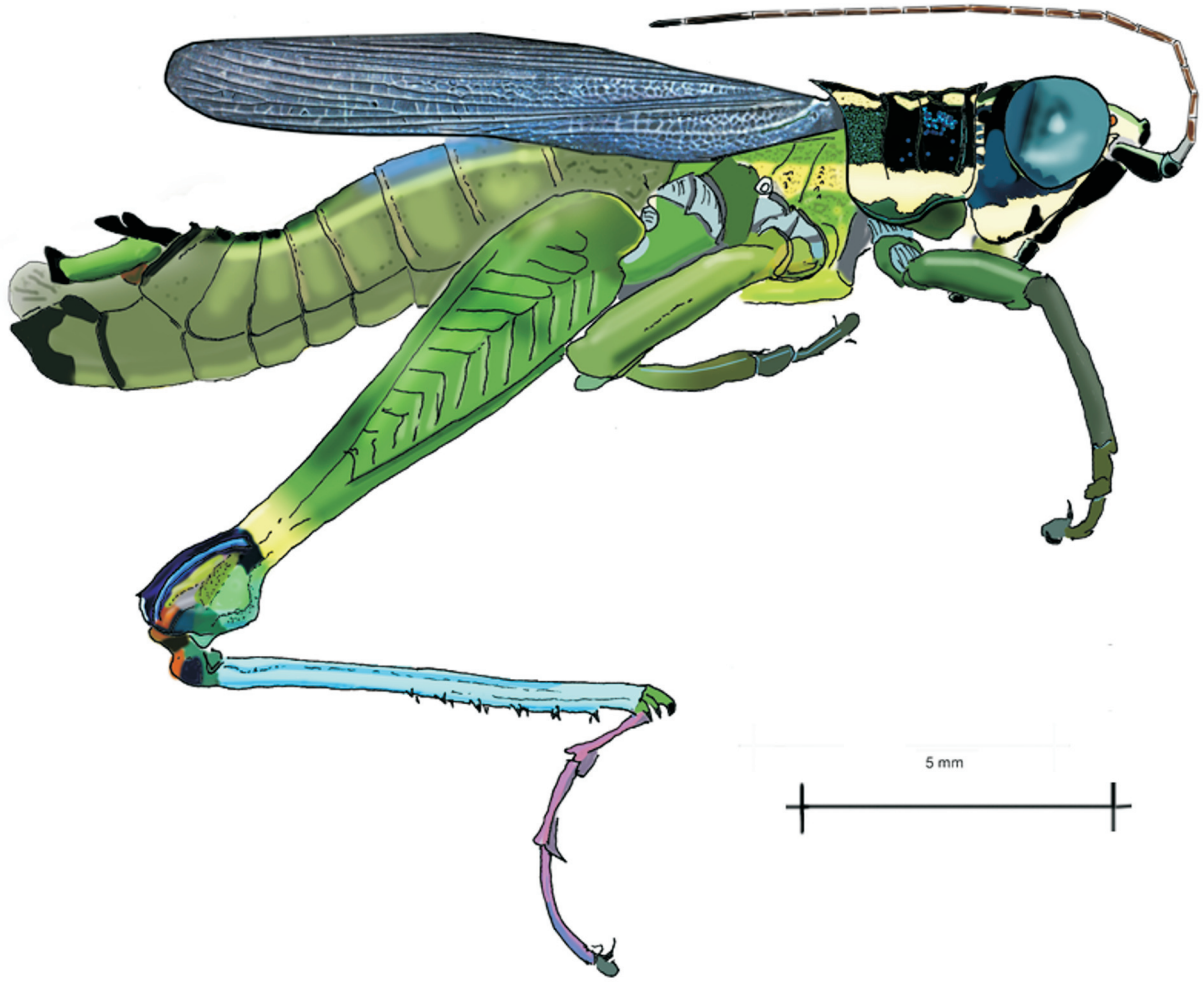

Fig.1. *Kritacris dicranophallus*, n.sp. Habitus. See also PLATE III.

Table 1. Dimensions of *Kritacris* spp. As all the species are closely similar in size, they are grouped together here; the summary values (mean, range) thus apply to the **genus**, not to the individual species. There is insufficient material to assess differences between the species. Abbreviations: P = pronotum in midline; IOS = Interocular space; L = Length, measured from tip of rostrum to end of abdomen; F = length of hind femur; FD =depth of hind femur, measured normal to long axis; T1-3, lengths of the three hind tarsal segments; Ant = antenna; n.d. = no data.

Males																
Species	**Specimen no.**	**Locality**	**P**	**IOS**	**L**	**F**	**FD**	**F/FD**	**T1**	**T2**	**T3**	**T1+2+3**	**Ant**	**Elytron**	**E/F**	**T1-3/F**
arboricola	Holotype	La Selva	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
arboricola	94063	Bijagua	2.96	0.1	19.05	9.81	2.32	4.23	1.44	1.47	1.94	4.85	9.6	11.06	1.13	0.49
licrophallus	97201	Cerro Uatsi	3.07	0.1	19.22	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	10	10.68	n.d.	
dicranophallus	99397	Tapanti	2.96	0.15	18.93	10.46	2.38	4.40	1.34	1.56	2.2	5.1	broken	11.39	1.09	0.49
												0				n.d.
		Mean	3.00	0.12	19.07	10.14	2.35	4.31	1.39	1.52	2.07	4.98	9.80	11.04	1.11	0.49
		Max	3.07	0.15	19.22	10.46	2.38	4.40	1.44	1.56	2.20	5.10	10.00	11.39	1.13	0.49
		Min	2.96	0.10	18.93	9.81	2.32	4.23	1.34	1.47	1.94	4.85	9.60	10.68	1.09	0.49
		N	3	3	3	2	2	2	2	2	2	2	2	3	2	2
								F.F.	0.28	0.30	0.42					
		Max/Min	1.04	1.50	1.02	1.07	1.03	1.04	1.07	1.06	1.13	1.05	1.04	1.07	1.04	1.01
Females																
Species	**Specimen no.**	**Locality**	**P**	**IOS**	**L**	**F**	**FD**	**F/FD**	**T1**	**T2**	**T3**	**T1+2+3**				
arboricola	Neallo-type	La Selva	3.7	n.d.	n.d.	11.7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	12	1.03	
?*arboricola*	94050	Bijagua	3.64	0.15	21.9	12.07	2.65	4.55	1.65	1.63	1.65	4.93	broken	13.48	1.12	0.41
licrophallus	83068	Suretka/Uatsi	3.55	0.19	20.73	11.92	2.73	4.37	1.53	1.54	2.3	5.37	8.5	12.59	1.06	0.45
licrophallus	79113	Progreso	3.85	0.19	22.75	12.65	2.85	4.44	1.65	1.86	2.52	6.03	broken	13.06	1.03	0.48
dicranophallus	99419	Tapanti	3.85	0.28	22.62	12.15	2.92	4.16	1.75	1.82	2.52	6.09	8.14	12.78	1.05	0.50
		Mean	3.72	0.20	22.00	12.10	2.79	4.38	1.65	1.71	2.25	5.61	8.32	12.78	1.06	0.46
		Max	3.85	0.28	22.75	12.65	2.92	4.55	1.75	1.86	2.52	6.09		13.48	1.12	0.50
		Min	3.55	0.15	20.73	11.70	2.65	4.16	1.53	1.54	1.65	4.93	8.14	12.00	1.03	0.41
		N	5	4	4	5	4	4	4	4	4	4	2	5	5	4
								F.F.	0.29	0.31	0.40					
		Max/Min	1.08	1.87	1.10	1.08	1.10	1.09	1.14	1.21	1.53	1.24		1.12	1.09	1.23
Sex dimorph m/f			0.81	0.58	0.87	0.84	0.84	0.98	0.85	0.88	0.92	0.89	1.28	0.86	1.05	1.07
Ratios in dimensions (e.g., E/F) all about unity — no sexual differences in proportions.																
m/f in linear dimensions 0.81-0.92.																

Phallic complex (Fig. 4) typical of the subtribe, with well-developed lateroventral sclerites that encircle it completely. Epiphallus bridge-shaped, with plate-like lophi and sharp curving ancorae. Cingular apodemes short and wide. Dorsal aedeagal sclerites fused into a medial valve along almost their entire length, only the very tips are free; form of valve variable. The ectophallic membrane forms two conical membranous projections flanking the base of the dorsal aedeagal valve. Endophallic plates laterally flattened and devoid of anterior apodemes. Flexure present, slender; ventral aedeagal valves are massive basally, their distal extremities may be simple (*K. arboricola*) or complex (*K. licrophallus*, *K. dicranophallus*).

Female: The female terminalia (Fig. 5) of all species are similar to those described by Descamps and Rowell (1984) for *K. arboricola* (see also Figs 5B, D, F). The subgenital plate is four-lobed, the inner lobes having species-specific shapes. Ovipositor valves strong and rather short, the upper valves with projecting rugosities visible in lateral view, the lower ones with a pronounced subterminal diastoma. Cerci short, conical, rounded at the tip and laterally compressed. Supra-anal plate short and triangular, rounded at the tip, medially excavated at its base, and crossed by a prominent melanised transverse carina. Spermatheca (Fig. 6C) characteristic of the subfamily, with a hooked terminal vesicle and long vermiform preapical diverticulum.

All species known to date have a similar coloration. The extent of light patterning on the mostly dark pronotum and frontal ridge differs slightly between the species (Fig. 7).

The dimensions of the specimens described below are given in Table 1. It can be seen that the three species are essentially identical in size and shape. Sexual dimorphism (m:f) of linear dimensions is about 0.85.

1. Kritacris arboricola Descamps 1976: 113.

"Genus and species undetermined", Roberts 1973: 63.
Descamps 1976: 114.
Descamps & Rowell 1984: 154.

Holotype male: COSTA RICA, Prov. Heredia, Sarapiquí, Rio Puerto Viejo, Finca La Selva LN 268800 5353005.3.1967 (by insecticidal fogging) (Roberts HR et al.) (ANSP).
Neallotype female: Same locality as holotype, 13.9.1979 (Rowell CHF) (MNHNP).

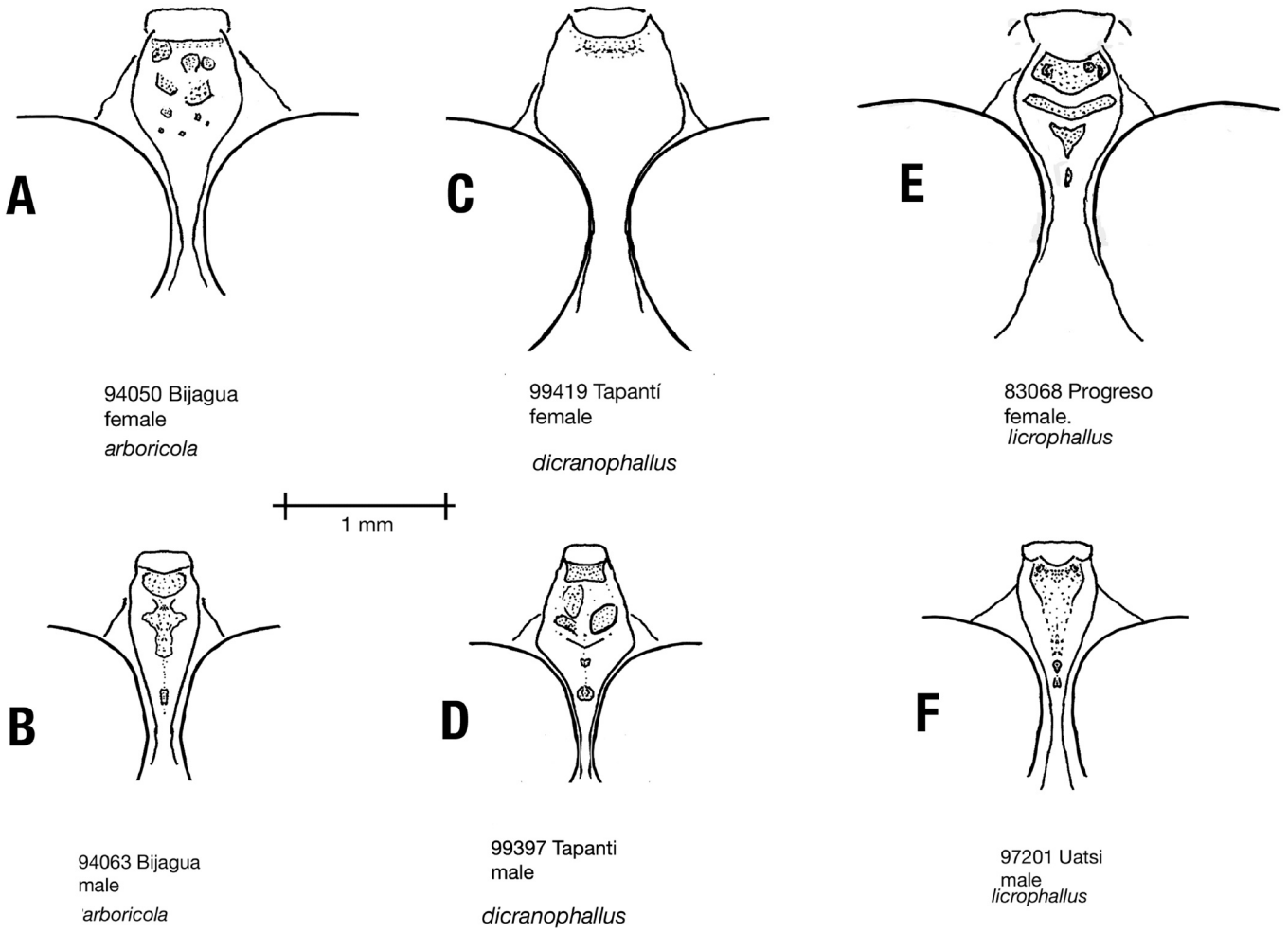

Fig. 2. Fastigia of *Kritacris* species. A, B: *arboricola*. C, D: *dicranophallus*. E, F: *licrophallus*.

The types of this species were not available during the present study, but Descamps' diagrams (reproduced in Figs 3A-C, & 4A,B) and descriptions are fully adequate for its determination.

Other material.—COSTA RICA: Prov. Limón: Valle de la Estrella: Progreso, Finca Cantón. LN192300 641000, 21.8.1979 (Rowell CHF, Rowell-Rahier M, Hyde C). 1 female, specimen no. 79113. (RC).
COSTA RICA, Prov. Alajuela: Upala, 20 km S. thereof: 4 km N. of Bijagua, 350 m, in Malaise trap, 24.9. 1990 (Parker FD), 1 male, specimen no. 94063. (EMUS).
Same locality and collector, 8.8.1990, one female, specimen No. 94050. (EMUS).

As I lack a male from the Valle de la Estrella (located a few km. N of the valley of the Sixaola), I cannot be certain that the female #79113 should be ascribed to *K. arboricola*, but on the basis of its subgenital plate, fastigium and the patterning of the pronotum, it seems very likely. Fig. 6 shows the internal genitalia. The spermatheca is of the characteristic proctolabine type, with a convoluted and vermiform lateral diverticulum and a hooked, roughly cylindrical, apical vessel. The duct is fine, issuing from a robust cylindrical bursa copulatrix which contains longitudinal sclerified elements in its walls. There is also a small sclerite at the point of departure of the duct. Basivalvular sclerites well developed, little curved. Margin of subgenital plate (Fig. 5A) four-lobed, the inner lobes bearing heavy plaque-like postvaginal sclerites on their dorsal face. Egg guide curved upwards at 45° and rounded at its tip (Fig. 5B).

Diagnosis.—The main distinguishing features of this species are its relatively unmodified phallic structures with entire unbranched ventral aedeagal valves (see Figs 3C & I and Introduction above). The male cerci of the holotype appear rather differently in the drawings of Descamps (1976) and of Roberts (1973) (Figs 3A, C), which may indicate that the two sides of the specimen differ slightly, but in both figures the cerci are shown as spatulate, laterally flattened at the tip and somewhat upturned.

The male supra-anal plate has the characteristic "horns" formed from its posterior corners; at their bases these merge into cuticular ridges which curve in towards the midline, and the posterior face of these ridges is produced into two small backwardly directed teeth (arrowed in Fig. 3B). This feature is absent in the other species.

The pronotum and the postocular region of the head have more white or yellow markings than in the other species of the genus. Especially, there are small pale patches between the first and third and the third and fourth sulci, about halfway up the lateral lobes. These are entirely absent in *dicronophallus* and very poorly developed in *licrophallus* (Fig. 7).

The subgenital plate (Fig. 6A) and to a lesser extent the fastigium (Fig. 2A) are diagnostic in the female of this and the other species. The inner lobes of the subgenital plate of *arboricola* are short and approximately rectangular, with a ragged melanised posterior mar-

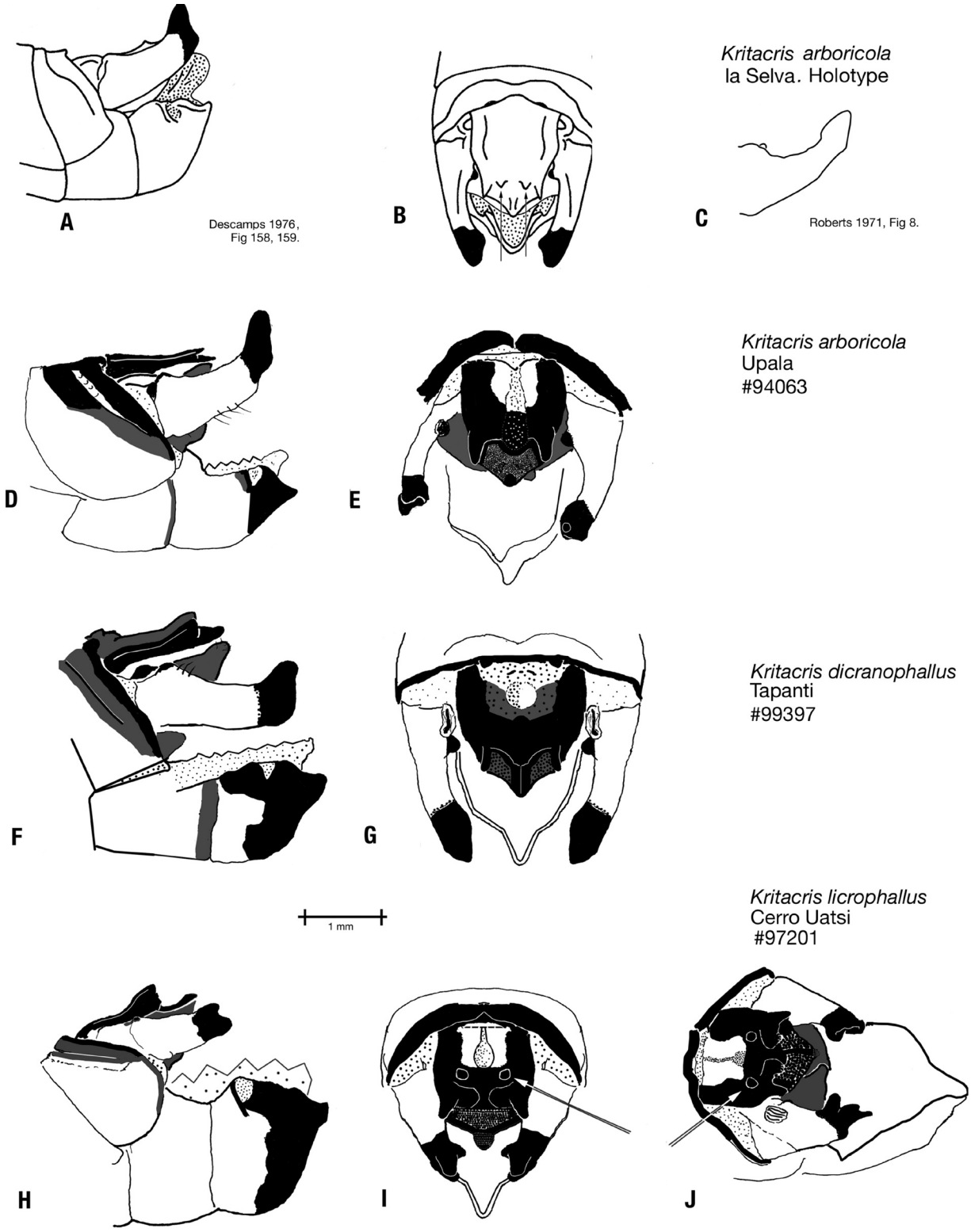

Fig. 3. *Kritacris spp.*, male terminalia. Note that Figs E - J are all made from dissected specimens, in which the pallium has been cut to extract the phallic complex. Only in A is the pallium intact. The scale bar applies only to Figs D-J. A-C: *Kritacris arboricola* Descamps, La Selva. Holotype. A. Lateral view of tip of abdomen. B. Dorsal view. C. Male cercus, lateral view. A & B from Descamps, 1976; C from Roberts, 1973 (the same specimen as A). D, E: *Kritacris arboricola*, Bijagua. D. Lateral view of tip of abdomen. E. Dorsal view. In E note absence of teeth arrowed in B. F, G: *Kritacris dicranophallus*, Tapantí. F. Lateral view of tip of abdomen. G. Dorsal view. H-J: *Kritacris licrophallus*, Cerro Uatsi. H. Lateral view of tip of abdomen. I. Dorsal view. J. Oblique view. Note bosses on supra-anal plate (arrowed), absent in other species.

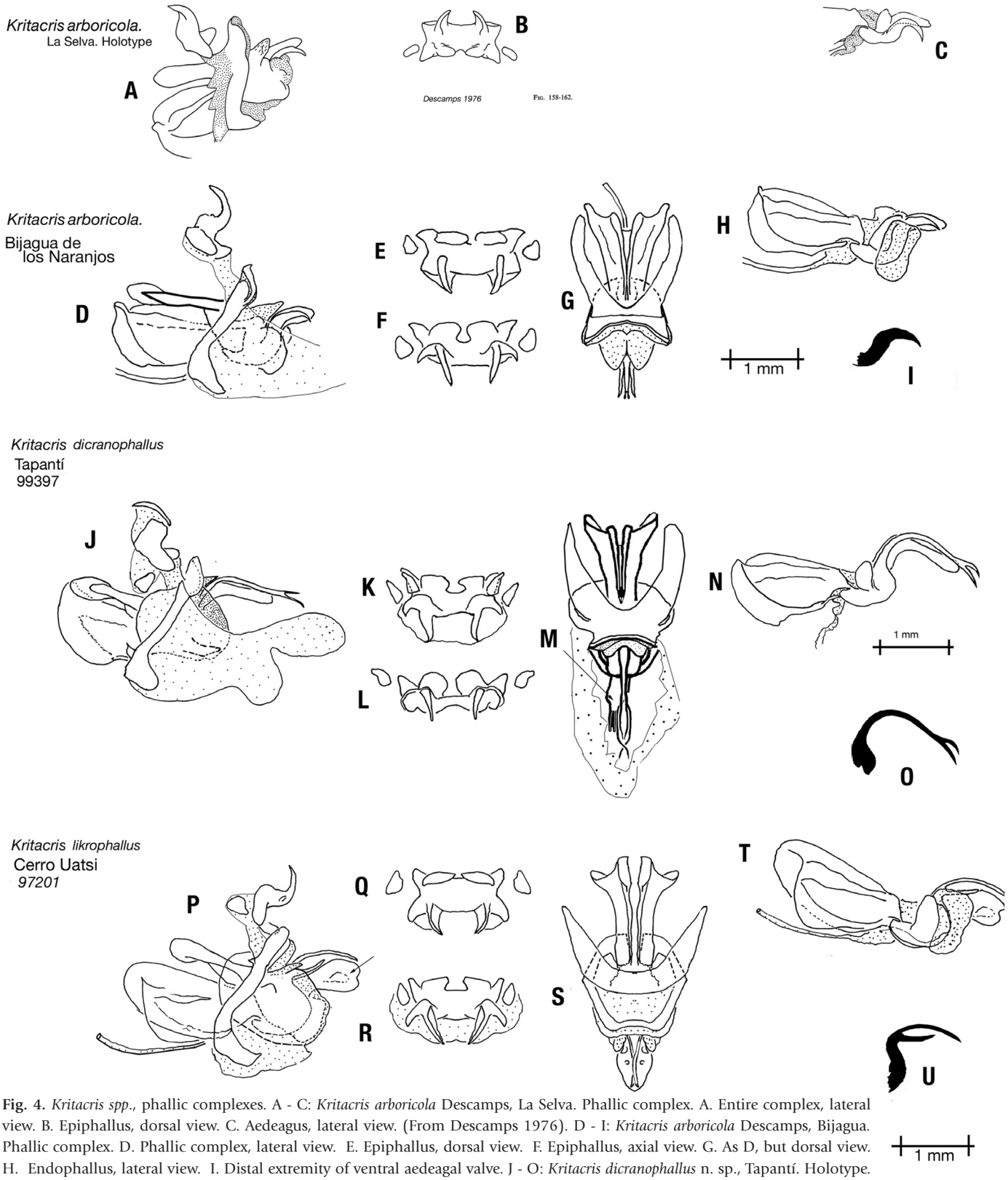

Fig. 4. *Kritacris spp.*, phallic complexes. A - C: *Kritacris arboricola* Descamps, La Selva. Phallic complex. A. Entire complex, lateral view. B. Epiphallus, dorsal view. C. Aedeagus, lateral view. (From Descamps 1976). D - I: *Kritacris arboricola* Descamps, Bijagua. Phallic complex. D. Phallic complex, lateral view. E. Epiphallus, dorsal view. F. Epiphallus, axial view. G. As D, but dorsal view. H. Endophallus, lateral view. I. Distal extremity of ventral aedeagal valve. J - O: *Kritacris dicranophallus* n. sp., Tapantí. Holotype. Phallic complex. J. Phallic complex, lateral view. Note sheath-like pallium to the lower right. K. Epiphallus, dorsal. L. Epiphallus, axial view. M. As J, but dorsal view. The pallium has been opened to show the aedeagus. The dorsal valve (arrowed) is displaced to one side to allow its bifid structure to be seen. N. Endophallus, lateral view. O. Distal extremity of ventral aedeagal valve. P - U: *Kritacris licrophallus*, n.sp., Cerro Uatsi. Holotype. Phallic complex. P. Phallic complex, lateral view. Note expanded tip of dorsal aedeagal valve (arrowed). Q. Epiphallus, dorsal view R. Epiphallus, axial view. S. As P, but dorsal view. T. Endophallus, lateral view. U. Distal extremity of ventral aedeagal valve.

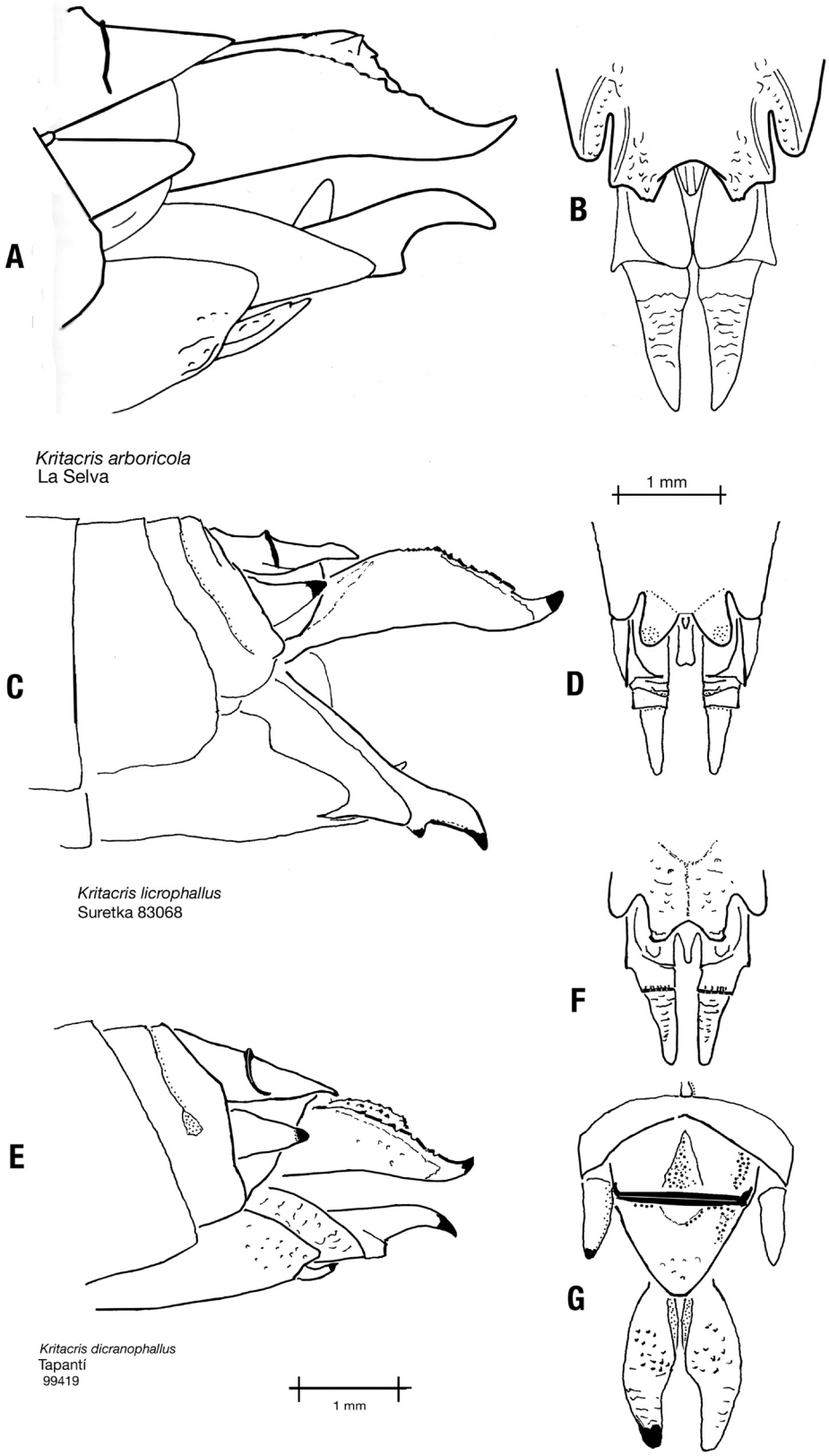

Fig. 5. *Kritacris spp.*, female terminalia. A, B: *Kritacris arboricola* Descamps, La Selva. Neallotype. A. Ovipositor, lateral view. B. Ovipositor and subgenital plate, ventral view. (From Descamps and Rowell, 1984). See also Fig. 6. C, D: *Kritacris licrophallus*, Suretka. C. Ovipositor, lateral view. D. Ovipositor and subgenital plate, ventral view. E - G: *Kritacris dicranophallus* n. sp., Tapantí. E. Ovipositor, lateral view. F. Ovipositor and subgenital plate, ventral view. G. Ovipositor and supra-anal plate, dorsal view.

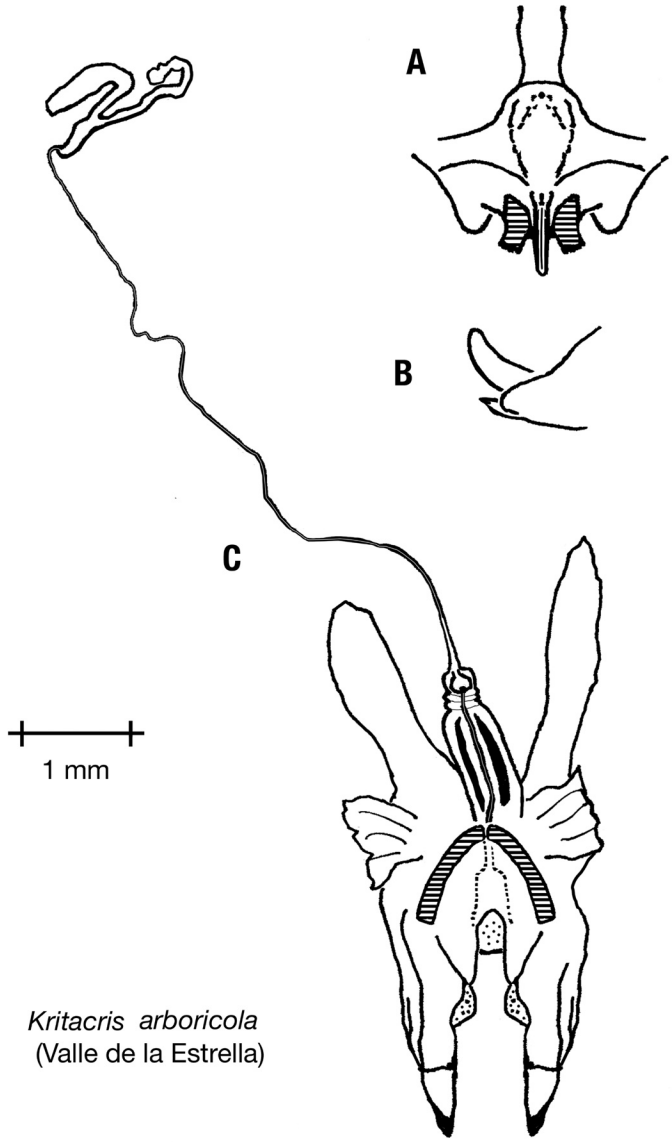

Fig. 6. *Kritacris arboricola*, Progreso, Valle de la Estrella. Internal female genitalia. A. Dorsal surface of subgenital plate. Postvaginal sclerites hatched. B. Egg guide, lateral view. C. Spermatheca, bursa copulatrix. Basivalvular sclerites hatched.

gin. Dorsal surface of fastigium flatter, less excavated than in other species, and in the female markedly rugose.

The general coloration and patterning of this species is given in the original descriptions. It should however be noted that the coloration in life is more greenish and less blue than given for the dried specimen. In this connection see also Descamps and Rowell 1984: 155.

2. Kritacris dicranophallus n. sp

Holotype male: COSTA RICA: Prov. Cartago: P.N. Tapantí, LN 194000 5598000: to light, 7.10.1999 (C.H.F. Rowell) Specimen no. 99397 (ANSP).
Paratype female: same locality, on undergrowth at forest edge, 8.10.1999 (C.H.F. Rowell) specimen number 99419 (ANSP).

Etymology.—Greek *Dikranon*, a two-pronged pitchfork, *Phallos*, penis, alluding to the form of the ventral aedeagal valve. Noun in apposition.

Diagnosis.— Distinguished from all other species of the genus by the form of the ventral aedeagal valves (Figs 4N, O). These are elongate and curved upward and backwards, rising above the slender fused dorsal aedeagal valves, and dividing at the tip to form two pointed branches, the more ventral of which is the longer. The tips of the ventral branches of the left and right ventral valves cross distally in the midline(Fig. 4M).

The tips of the male cerci (Fig. 3F) are similar in shape to those of *K. arboricola* (Fig. 3D), with the dorsal corner being produced upwards. The supra-anal plate (Fig. 3G) differs slightly, in that the ridge running between the two lateral "horns" at the distal corners of the roughly oblong plate, is not produced into two backward pointing smaller projections as in *arboricola* (arrowed in Fig. 3B).

Dorsal surface of fastigium (Fig. 2C, D) mostly smooth, but briefly excavated distally just behind the transverse terminal ridge. The lateral lobes of the pronotum are not marked with small pale patches as in *arboricola* and *licrophallus* (Fig. 7C).

The subgenital plate of the female (Fig. 5E) is most similar to that of *K. arboricola*.

The female of this species is less brightly colored than that of *arboricola*, being more brownish overall. The membrane of the elytron is blue, but is almost completely obscured by the dense reticulum of brownish veins. In both sexes the interocular space is somewhat wider than in the other species of the genus (Table 1).

3. *Kritacris licrophallus* n.sp.

Holotype male: COSTA RICA: Prov. Limón: Cerro Uatsi, above Bribri, LS 396900 579600, at forest edge, on *Trema*, 24.8.1997 (C.H.F. Rowell, I. Singh). Specimen no. 97201 (ANSP).
Paratype female: COSTA RICA: Prov. Limón: 7 km. N. of Suretka, 230 m., trail to Río Uatsi, in treefall clearing, on *Trema*. Lambert South coordinates: 395400 581800. 21.9.1983 (C.H.F. Rowell), specimen number 83068. ANSP.
Other paratypes: COSTA RICA: Prov. Limón: 5 km N. of Suretka, 230 m, trail to Río Uatsi, on newly felled *Trema* tree, LS 395400 581800, one female, 20.9.1983 (C.H.F. Rowell) specimen 83069. Specimen with incompletely expanded elytra. (RC).
COSTA RICA: Prov. Limón: Amubrí, 70m, LS 385000 578100, one male, 10.6.1995 (Garballo G), specimen number CRI 002 235390 (INBio).

Etymology.— Greek *Likros*, antler, *Phallos*, penis, alluding to the form of the ventral aedeagal valve. Noun in apposition.

Diagnosis.— In phallic structure (Figs 4P, U) rather similar to *K. dicrophallus*, to which it is probably related. Differs from that species as follows: the ventral aedeagal valves fork more proximally, and the more ventral branch forms a shorter horizontal "tine" running along the upper surface of the fused dorsal valve. The overall structure resembles the branching of a deer's antler, hence the specific name. The dorsal aedeagal valve (Figs 4R, S) is expanded and is both wider and (in lateral view) deeper than in *dicrophallus*.

The male cercus (Fig. 3H) is distinctive, being divided into three short processes at its tip, two on the external face and one on the internal face. The supra-anal plate bears two small melanized circular bosses anterior to the distal "horns", and its posterior terminal

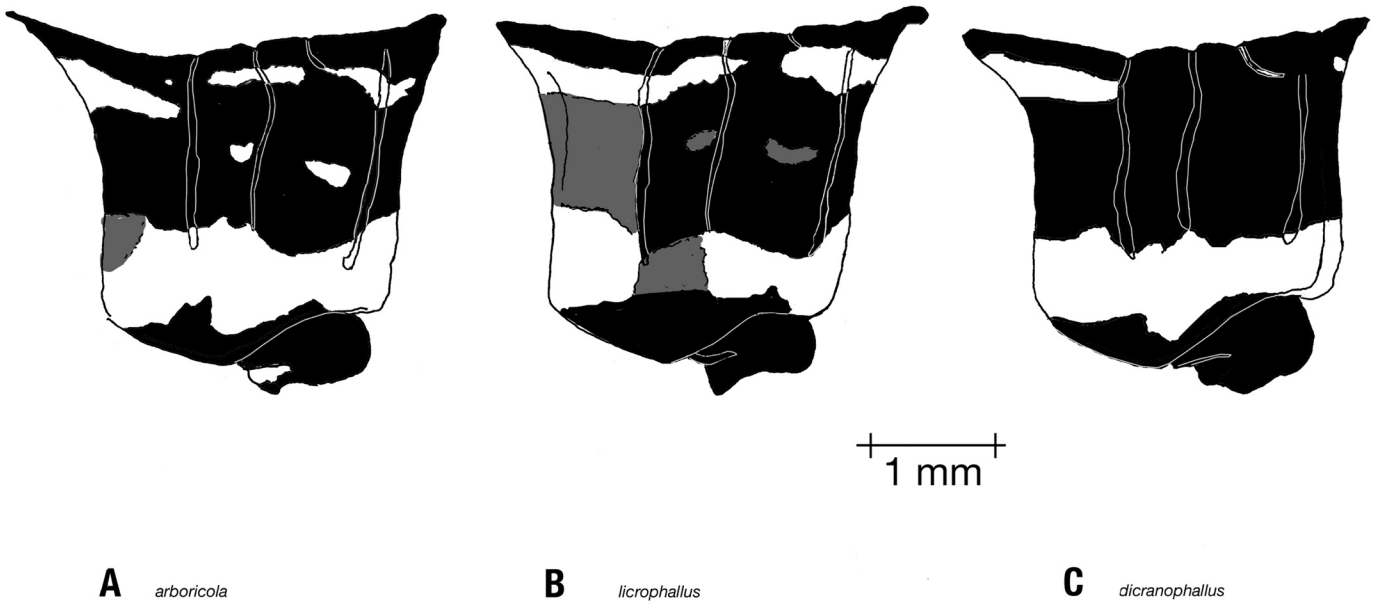

Fig. 7. *Kritacris* spp, patterns of coloration of pronotum in males. A. *arboricola*. B. *licrophallus*. C. *dicranophallus*. Grey areas are impure yellow, white areas pure yellow or white in life. Note the twin lateral patches present in *arboricola*, which are obscured in *licrophallus* and absent in *dicranophallus*.

process is covered with minutely tuberculate cuticle. From the base of the "horns" two well defined ridges curve inwards towards the midline, and their posterior edges are decorated with small blunt teeth, reminiscent of the sharper and larger structures seen in *arboricola*.

Dorsal surface of fastigium (Figs 2E, F) clearly concave and excavated, often with one or two chevron-shaped depressions immediately behind the terminal tranverse ridge, especially in females. Lateral lobes of pronotum with a pattern of light markings similar to that of *arboricola*, but with less contrast. (see Fig. 7B).

Discussion

There are still too few specimens to assess the intraspecific variation found at each of the studied localities. All the species of *Kritacris* have been described from unique male holotypes. There seems no question however, but that the three named forms represent good species, as the phallic differences between them are large and clear. Unfortunately, the external differences are minimal. The genus thus comprises several cryptospecies, in the sense of species which are not readily determinable without dissection. The situation is particularly difficult in the case of the females, which apart from small color differences, and some variation in the fastigia and the subgenital plate, appear to be indistinguishable. As far as can be told from casual observation, the natural history of the different species is uniform – all are associated with the tree *Trema*, and the different species presumably correspond to local isolates of an originally continuous population. It is quite likely that further differentiated populations remain to be found in other Caribbean slope localities.

The relationships between the the species are unclear. On phallic structure, it seems clear that *licrophallus* and *dicronophallus* form a species pair, with *arboricola* less closely similar; however the pattern of pronotal coloration and of the female subgenital plates suggests rather a link between *arboricola* and *licrophallus*. Molecular data would be helpful here.

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Fig. 8. *Kritacris*, distribution map. Note the wide spread of localities for *arboricola* over the northeastern part Costa Rica, and the localized occurrence of the other two species.