

*TAINACANTHUS FEROX*, A REMARKABLE NEW GENUS AND SPECIES  
OF KATYDIDS FROM THE HIGH MOUNTAINS OF HISPANIOLA  
(ORTHOPTERA: TETTIGONIIDAE: PSEUDOPHYLLINAE: POLYANCISTRINI)

*Tainacanthus ferox*, un excepcional nuevo género y especie de esperanzas de las altas  
montañas de la Hispaniola (Orthoptera: Tettigoniidae: Pseudophyllinae: Polyancistrini)

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ABSTRACT

The new genus and species of Polyancistrini katydids *Tainacanthus ferox* **gen. nov.**, **sp. nov.** is described from specimens collected in the highest mountains of the Dominican Republic, island of Hispaniola. This is the third genus of Polyancistrini known from Hispaniola and the seventh genus of the tribe. *Tainacanthus* is distinctive due to the unique architecture of its pronotum, which is a large and bulbous shield with an extended metazona that covers and protects the stridulatory apparatus surrounded by a relatively small number of large and sharp spines. Additionally, all legs are armed with larger and more robust spines than those of *Polyancistrus* Audinet-Serville, 1831, its most likely closest relative. *Tainacanthus* inhabits the highest mountains of the Dominican Cordillera Central at over 2,400 m above sea level, living among hard-leaf evergreen vegetation interspersed with pine forests. The type locality is included within the Armando Bermúdez National Park, one of the most important protected areas in the Dominican Republic.

*Keywords:* Tettigonioidea, taxonomy, biodiversity, distribution, Greater Antilles, West Indies.

RESUMEN

Se describe el nuevo género y especie de esperanzas Polyancistrini *Tainacanthus ferox* **gen. nov. sp. nov.**, a partir de especímenes colectados en las montañas más altas de la República Dominicana, isla de la Hispaniola. *Tainacanthus* es el tercer género conocido de Polyancistrini de la Hispaniola y el séptimo género de la tribu. *Tainacanthus* se distingue por la arquitectura única de su pronoto, el cual es un escudo grande y bulboso con metazona extendida que cubre y protege el aparato estridulador, rodeado por unas pocas espinas grandes y puntiagudas. Adicionalmente, todas sus patas son armadas con espinas más grandes y robustas que en *Polyancistrus* Audinet-Serville, 1831, su probable pariente más cercano. *Tainacanthus* habita las montañas más altas de la Cordillera Central Dominicana por encima de 2,400 m sobre el nivel del mar, viviendo entre vegetación perenne de hojas gruesas entremezclada con bosques de pino. La localidad tipo se incluye dentro del Parque Nacional Armando Bermúdez, una de las áreas protegidas más importantes de República Dominicana.

*Palabras clave:* Tettigonioidea, taxonomía, biodiversidad, distribución, Antillas Mayores, Indias Occidentales.

## INTRODUCTION

The Pseudophyllinae with just over one thousand species are the second most diverse group of katydids after the Phaneropterinae (Gwynne, 2001). These katydids are differentiated from other subfamilies of Tettigoniidae by having front tibiae without terminal spines above, an open auditory tympanum and antennal scrobes or pits with the margins raised or produced (Bruner, 1915). Pseudophyllines are predominantly found in tropical habitats and appear to be most diverse in the New World tropics. Although usually large, morphologically they encompass a variety of forms and colorations, including species that mimic leaves, bark or other background, also including brachypterous species with reduced wings (Gwynne, 2001). The Orthoptera Species File online database (Cigliano *et al.*, 2018) includes 20 tribes within the Pseudophyllinae. The tribe Polyancistrini Brunner von Wattenwyl, 1878 are medium-sized to large (25–50 mm) and heavy katydids, characterized by having a robust body, most often with markedly reduced wings and a pronotum that extends over the base of the tegminae in both sexes.

Hitherto this tribe was comprised of six genera: *Polyancistrus* Audinet-Serville, 1831 and *Spelaeala* Rehn, 1943 from Hispaniola, *Sagephorus* Redtenbacher, 1895 from Mexico, *Polyancistroides* Rehn, 1901 from Cuba, *Camposiella* Hebard, 1924 from Ecuador, and *Spinapecta* Naskrecki & Lopes-Andrade, 2005, from Brazil. *Tainacanthus* **gen. nov.** like *Spelaeala* and most of the species of *Polyancistrus* has very reduced scale-like or lobate tegminae that form a bulbous stridulatory apparatus covered by a shield-like expansion of the pronotum in both sexes. *Tainacanthus* **gen. nov.** is endemic to the high mountains (over 2,400 m above sea level) of the Cordillera Central of Hispaniola. A list of the Greater Antillean species is shown in Table I.

The first Hispaniolan Polyancistrini was described by Palisot de Beauvois (1805) as *Locusta serrulata*, later transferred to the newly proposed genus *Polyancistrus* Audinet-Serville (1831). The genus *Polyancistrus* was reviewed by Rehn (1936) using a sample of 79 specimens from Haiti and the Dominican Republic gathered from various North American museum collections. Rehn (1936) described five additional species, most of them having marked wing reduction. Subsequently, Rehn (1943) described the smaller and nearly apterous genus *Spelaeala*, based on a small series of seven specimens that included two species, both also from the Cordillera Central of the Dominican Republic. The most recent addition to the Polyancistrini is the genus *Spinapecta* from southeastern Brazil (Naskrecki & Lopes-Andrade, 2005), which significantly expanded the geographical range of the tribe.

In this paper, I describe and illustrate the seventh known genus of the tribe Polyancistrini and the third known from the Caribbean island of Hispaniola. Comments are included on its song, together with observations on its habitat and behavior.

## OBJECTIVE

- To provide the taxonomic description of a new genus and species of Polyancistrini katydids from high mountain localities in the Dominican Republic.

Table I. List of the Greater Antillean Polyancistrini species

Species	Island	References
Genus <i>Polyancistrus</i> Audinet-Serville, 1831		
<i>Polyancistrus serrulatus serrulatus</i> (Palisot de Beauvois, 1805)	Hispaniola	Rehn (1936)
<i>Polyancistrus serrulatus oreiotes</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus atlas atlas</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus atlas pilanus</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus loripes</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus darlingtoni</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus abbotti</i> Rehn, 1936	Hispaniola	Rehn (1936)
<i>Polyancistrus gerulus</i> Rehn, 1936	Hispaniola	Rehn (1936)
Genus <i>Spelaeala</i> Rehn, 1943		
<i>Spelaeala bondi</i> Rehn, 1943	Hispaniola	Rehn (1943)
<i>Spelaeala scobina</i> Rehn, 1943	Hispaniola	Rehn (1943)
Genus <i>Tainacanthus</i> n. g.		
<i>Tainacanthus ferox</i> n. sp.	Hispaniola	This work
Genus <i>Polyancistroides</i> Rehn, 1901		
<i>Polyancistroides carcinus</i> Rehn, 1937	Cuba	Rehn (1937)
<i>Polyancistroides xanthicles</i> Rehn, 1937	Cuba	Rehn (1937)
<i>Polyancistroides gundlachii</i> (Bólvivar, 1884)	Cuba	Rehn (1937)

## MATERIALS AND METHODS

From 2002–2004 we carried out a project to survey the Hispaniolan orthopteroid insects of the Dominican Republic. A total of 280 localities covering a large portion of the Dominican geography were sampled. These collections afforded two opportunities to visit the highest central mountains in which specimens of *Tainacanthus* were collected. Katydidids were located tracking their intermittent songs and were collected with the help of an entomological net. For better preservation, the abdominal contents of the first series of specimens were taken out and their abdomens refilled with small pieces of napkins. Specimens of the second series were not gutted, as this did not appear to be necessary for good preservation. The stridulatory apparatus was examined in a comparative manner by partially dismembering one male and one female of each genus of Hispaniolan Polyancistrini.

Photographs were taken using the Visionary Digital (TM) BK Lab imaging system outfitted with a Canon Mark II 5D. Scanning electron micrographs (SEMs) were obtained using a Hitachi TM 3000 microscope. For improved conductivity and better SEM imaging of the specimens, these were coated with a thin layer of gold/palladium alloy.

Body measurements (except for the interocular distance measured with a scale under a stereoscope) were made using a digital fractional caliper with resolution to 0.01 mm. The body and pronotum length were measured on the dorsal midline, while the hind femur and tibia length were measured along the side. Locality data are given as they appear on the labels. In our project labels, the designation RD-046 represented the locality number [i.e., República Dominicana - #046].

### Specimen depositories

ANSP– Academy of Natural Sciences, Philadelphia, Pennsylvania. IIBZ– Instituto de Investigaciones Botánicas y Zoológicas, Universidad Autónoma de Santo Domingo, Dominican Republic. MNHNSD– Museo Nacional de Historia Natural, Santo Domingo, Dominican Republic. MSUC– Montana State University Collection, Bozeman, Montana. USNM– United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.

## RESULTS

### Taxonomy

Family Tettigoniidae Krauss, 1902

Subfamily Pseudophyllinae Burmeister, 1838

Tribe Polyancistrini Brunner von Wattenwyl, 1878

*Tainacanthus* Perez-Gelabert, **gen. nov.**

(Figs. 1–30)

*Diagnosis.* Distinguished from its apparent closest relative (*Polyancistrus*) by both sexes having a larger pronotum which is heavily armed around its margins by few, sharp and strong spines; legs with femora armed with spines only ventrally. Female ovipositor a short and relatively thick sword that curves gently upwards and tapers to a fine tip. The coloration of both sexes is a combination of light/dark brown and camouflage green. This coloration is unique to *Tainacanthus*, as *Polyancistrus* and *Spelaeala* are most commonly reddish brown and less often dark green. Some individuals of these last two genera show a combination of green and brown.

*Diagnosis (In Spanish).* Distinguible de su aparente pariente más cercano (*Polyancistrus*) por ambos sexos tener un pronoto grande el cual es fuertemente armado en sus márgenes por unas pocas espinas, agudas y fuertes; patas con fémures armados con espinas solo ventralmente. Ovipositor de la hembra una espadita corta y relativamente gruesa que curva suavemente hacia arriba y se hace angosta hasta terminar en punta fina. La coloración de ambos sexos es una combinación de castaño claro/oscurito y verde camuflaje. Esta coloración es única de *Tainacanthus*, ya que *Polyancistrus* y *Spelaeala* son más comúnmente castaño rojizo y menos frecuentemente verde oscuro. Algunos individuos machos de estos últimos dos géneros presentan una combinación de verde y castaño.

*Description.* See species description below.

*Type species.* *Tainacanthus ferox* Perez-Gelabert **sp. nov.**, by original designation.

*Etymology.* The generic name is in honor of the Taino natives of Hispaniola and the Greater Antilles, combined with *acanthus*, a Latinized form of the Greek *acanthos*, meaning “thorny”, an epithet referring to the spiny nature of these katydids. This generic name is masculine.

*Distribution.* Only known from the highest mountains of the Cordillera Central, Dominican Republic, Hispaniola.

***Tainacanthus ferox* Perez-Gelabert, sp. nov.**

(Figs. 1–30)

*Type material.* HOLOTYPE: Male, DOMINICAN REPUBLIC RD-046 La Participación, Parque Nacional Armando Bermúdez, La Vega Prov., 19°02.246'N 70°58.147'W, 17.vii.2002, D. Perez, B. Hierro, R. Bastardo. Deposited at USNM entomological collection with catalog number USNMMENT 01563335.

*Coloration.* Body color a combination of dark and light brown and camouflage green; integument not shiny but a buff brown. Epimera lighter brown than surrounding areas; dorsal surfaces of legs and abdomen cream or light brown. Outer borders of tegminae marked by a cream yellowish flattened area that is also markedly veiny. All spines on hind tibiae light brown or more rarely light green.

### **Morphology**

Both sexes robust, medium-sized katydids (28–32 mm), brachypterous, and characteristically armed with strong, sharp spines on pronotum, dorsal abdominal midline and legs (Figs. 1–4).

*Head.* Rounded, relatively small, with small globular eyes; head vertex not elevated above pronotum, with fastigium of vertex not produced forward of eyes. Face relatively flat and smooth (Fig. 5). Antennae about 1.5X the body length and bearing a spine on its proximal article. This spine is more developed in *Polyancistrus* and *Spelaeala*.

*Thorax.* Pronotum a large thickened shield extended over and completely covering the remnants of tegminae; its margins armed with few (8), sharp and strong spines that are curved down or to the sides (middle anterior spines extend up, while the two flanking spines extend out) (Fig. 11). Prosternum, mesosternum and metasternum strongly developed, each armed with short and sharp spiny corners (Fig. 10).

*Wings.* Tegminae scale-like or lobate, less than half the length of pronotum and inflated into a bulbous dome that covers the stridulatory apparatus. This dome is slightly less bulbous in females. Small remnants of the membranous wings are present under the tegminae.

*Abdomen.* Globose in outline in both sexes. Male dorsal abdominal midline marked by small spines that grow on distal end of each tergum; these spines are noticeably longer and sharper in females. Margin of 10<sup>th</sup> tergite deeply emarginated (Fig. 6).

*Legs.* Strong, more robust in males than in females; anterior, middle and posterior femora armed only on ventral margins; all tibiae armed with long and strong spines on internal, external and ventral margins. Tympanal openings very similar in both sexes, located near the top 1/5 of the tibiae, the opening elliptical, rounded at top and closing at the bottom.

*External genitalia.* Epiproct triangular. Male cerci simple and relatively small, with one small apical tooth (Fig. 6). Margin of tenth tergite with marked concavity; male subgenital plate with v-shaped incision and short styli (Fig. 7). Female ovipositor a short thick sword that gently

curves upward and tapers into a sharp point, its length just about half the length of abdomen (Figs. 2, 4, 9). This ovipositor morphology corresponds to katydids that lay their eggs within bark crevices (Gwynne, 2001).

*Stridulatory apparatus.* (Figs. 21–28) Both sexes of Polyancistrini katydids produce sounds. The sound production mechanism differs between the sexes, males have one stridulatory file located under the left tegmen made of about 80 teeth (Figs. 21–22), while females have a “stridulatory file” located dorsally on each tegmina (Figs. 23–24), consisting of a series of over 60 sclerotized pegs in each tegmina. Electron micrographs show the detailed structure of the stridulatory pegs in both sexes; those of the males are thickened and somewhat flattened teeth (Figs. 25–26), while those of the females appear as small spiny denticles with differences between the left and right sides (Figs. 27–28). Examination of individuals of both sexes in various species of Hispaniolan *Polyancistrus* and *Spelaeaala* showed that they also have a similar mechanism for sound production in both sexes.

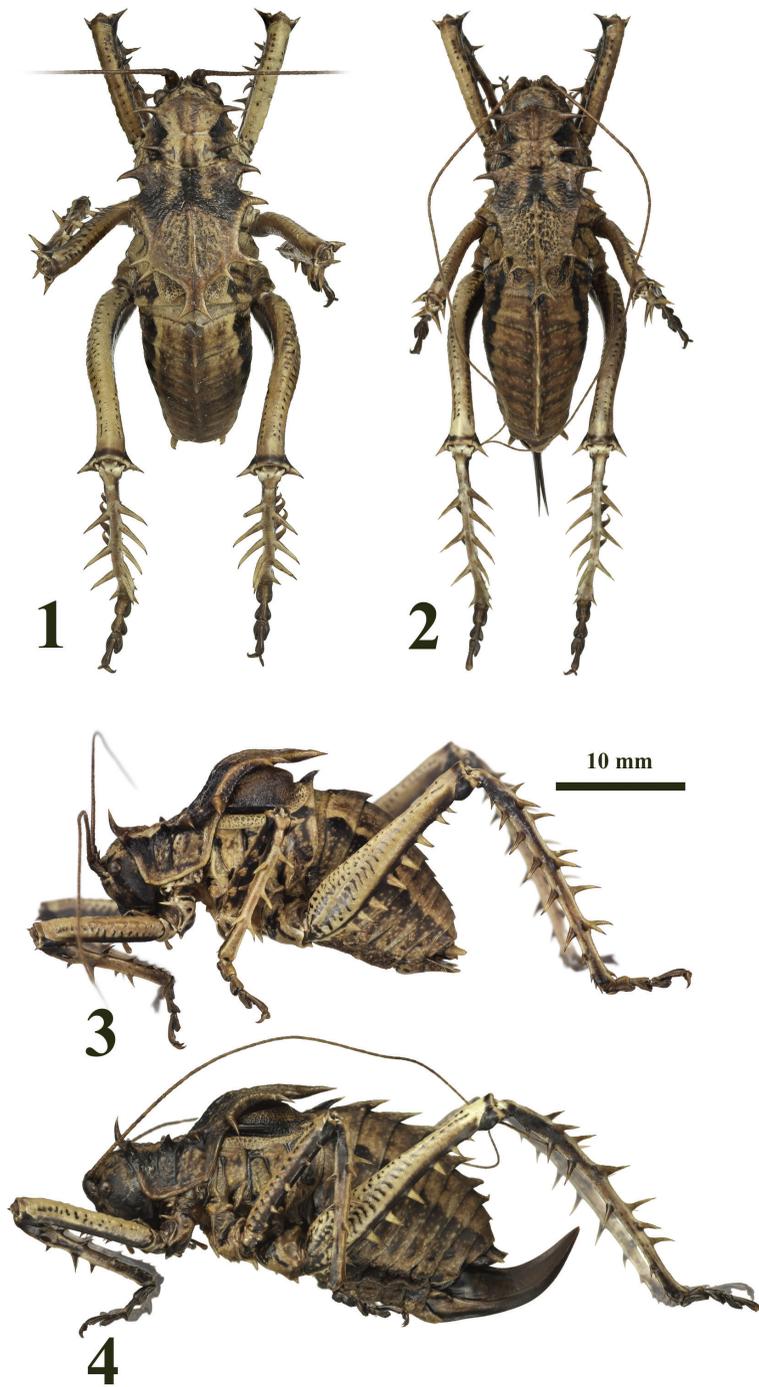
*Song.* The song of male *Tainacanthus* can be described as three (sometimes two) short and not very loud notes that are repeated intermittently every few seconds. These songs are relatively weak though it is possible to hear them from over 30 meters away. This is different from the species of *Polyancistrus*, for example, *P. serrulatus*, which can produce very loud calls which are repeated every few seconds.

*Other material examined.* ALLOTYPE: Same data as holotype, with catalog number USNMNT 01563336. PARATYPES: 12 males 5 females and 3 juvenile males, same data as holotype (ANSP, USNM, MNHNSD, IIBZ). 15 males 9 females, DOMINICAN REPUBLIC RD-254 La Compartición, P[arque] N[acional] Armando Bermúdez, La Vega Prov., 2,450 m, 1-2.vii.2004, D. Perez (d[ay]/n[ight]) (USNM, ANSP, NMNH, MHND, IIBZ). 1 female, DOMIN. [ICAN] REP.[UBLIC] Santiago, Par.[que] Nac.[ional] Armando Bermudez N.[orth] slope of La Pelona 09 July 1992, sweeping veg 2425 m, M. A. & R. O. Ivie (MSUC). 2 males, same locality as type, but 04/xi/2012, cols. D. Perez, C. Ramírez (IIBZ).

*Measurements (in mm).* 5 males: BL (Body length: Head to end of abdomen) Mean = 28.66, range = 27.69–32.20; PL (Pronotum length): Mean = 15.73, range = 15.05–16.55; HFL (Hind femur length): Mean = 17.36, range = 16.59–18.35; TI (Tibia length): Mean = 20.50, range = 19.59–21.91. 5 females: BL (Body length): Mean = 29.92, range = 25.69–33.03; PL (Pronotum length): Mean = 15.66, range = 15.08–16.32; HFL (Hind femur length): Mean = 17.89, range = 16.14–18.91; TI (Tibia length): Mean = 21.02, range = 20.63–21.71; OVI (Ovipositor length): Mean = 12.64, range = 12.27–13.03.

*Etymology.* *Ferox*, referring to the threatening appearance given by the spiny armature of these katydids. In fact, they are very shy and gentle insects with slow deliberate movements. Their main defense strategy when threatened is to drop from their perch and try to be invisible among the underbrush.

*Habitat.* The flora and vegetation of the Pico Duarte area was characterized by Zanoni (1993). The area of La Compartición is located at 2,450 m above sea level. At this high elevation, the vegetation is pine forest (*Pinus occidentalis* Sw.) interspersed with a lower stratus of hard evergreen shrubs, commonly *Myrica picardae* Krug & Urb. (Myricaceae), *Lyonia heptamera* (Ericaceae), the bunch grass (*Danthonia domingensis* Hack. & Pilg.) (Poaceae), ferns and lichens (Figs. 29–30). Other shrubs characteristic of the understory are *Myrsine coriacea* (Sw.) (Myrsinaceae), *Ilex tuerkheimii* Loes (Aquifoliaceae), *Baccharis myrsinites* (Lam.) (Asteraceae) and *Garrya fadyeni* Hook (Garryaceae).

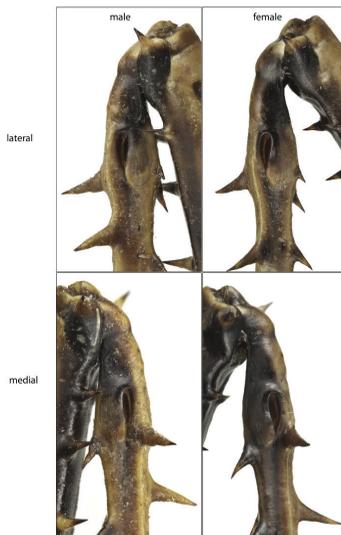


Figures 1–4. Habitus pictures of *Tainacanthus ferox* gen. nov., sp. nov. 1, male (dorsal). 2, female (dorsal). 3, male (lateral). 4, female (lateral).



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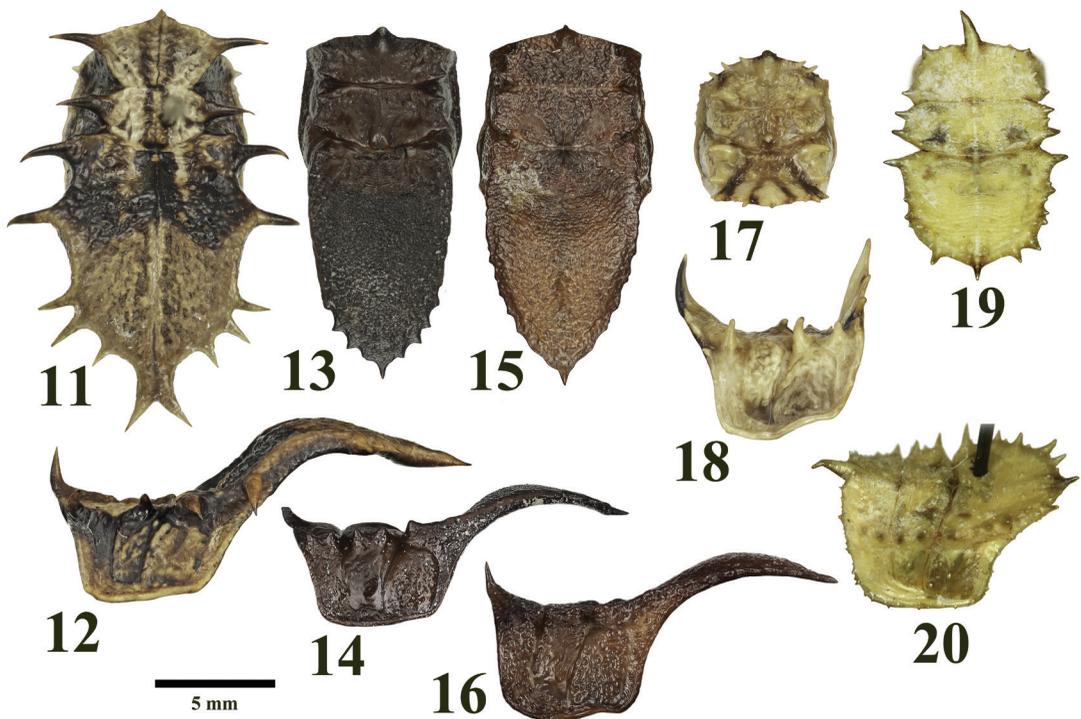


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Figures 5–9. Morphology of several body parts of *Tainacanthus ferox* gen. nov., sp. nov. 5, face of male. 6, male abdominal end. 7, male subgenital plate (ventral). 8, male and female tympana on forelegs (lateral and medial views). 9, female subgenital plate and ovipositor (ventral).



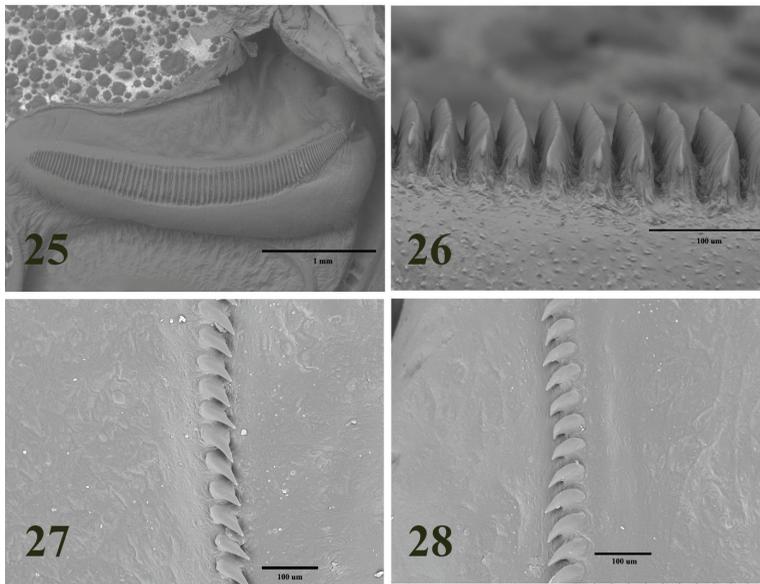
Figure 10. Morphology of the thorax (ventrally) *Tainacanthus ferox* gen. nov., sp. nov.



Figures 11–20. Comparison of pronotal morphology across the genera of Caribbean Polyancistrini (dorsal and lateral views). 11 and 12, *Tainacanthus* gen. nov. 13–16, *Polyancistrus*. 17–18, *Spelaeala*. 19–20, *Polyancistroides*.



Figures 21–24. Stridulatory apparatus in both sexes of *Tainacanthus ferox* **gen. nov., sp. nov.** 21, right and left tegmen of male, 22, detail of the male stridulatory file. 23, right and left tegmen of female. 24, detail of the female stridulatory apparatus in the anal field of both wings.



Figures 25–28. SEM of male and female stridulatory structures of *Tainacanthus ferox* **gen. nov., sp. nov.** 25, stridulatory file located under right tegmen. 26, detail of some stridulatory teeth in the male file under high magnification. 27 and 28, detail of female stridulatory teeth on left and right tegmens.



Figures 29–30. Two views of the vegetation at the type locality of La Compartición, Parque Nacional Armando Bermúdez.

At night katydids persistently called from protected sites within the shrubs always perched at heights of less than two meters above the ground, becoming silent when approached. One of the main physical features of this environment are the cold temperatures typical of these high elevations in Hispaniola. Nights can be very cold and winter temperatures can reach 0 °C. Among the parasites of pseudophyllines in Hispaniola, Perez-Gelabert and Grogan (1999) documented the ceratopogonid (Diptera) *Forcipomyia (Microhelea) tettigonaris* Wirth and Castner, as a sporadic ectoparasite of juvenile *Polyancistrus* and *Spelaeala* at two lower elevation sites of the Cordillera Central. The same parasitism was later observed on a juvenile *Polyancistrus* in Sierra de Bahoruco. Juvenile individuals which have a softer integument are always the ones affected with this parasitism. Other possible predators of these katydids are birds and bats, but their populations at high elevations are likely to be much smaller than at lower areas. Probably the current biggest predation threat to these katydids are the rats (*Rattus rattus* L.) that have followed human visitors and their food up these mountains. Sikes and Ivie (1995) reported the probable predation by rats of the endemic butterfly *Anetia briarea* at aggregation sites in the Pico Duarte area. No rats were seen at the park quarters of La Participación during a first visit to Pico Duarte in 1987, but these were an obvious nuisance at the shelter in the 1990's and 2000's.

#### KEY TO THE GENERA OF WEST INDIAN POLYANCISTRINI (BOTH SEXES)

- 1A. Pronotum relatively small, saddle-shaped surrounded by small spines with metazona not much extended caudad over the tegminae (stridulatory apparatus). Figures 17–18. Dorsal surface of anterior femora with several rows of spines.....*Spelaeala*
- 1B. Pronotum relatively large, saddle-shaped with metazona markedly extended caudad over the tegminae (stridulatory apparatus). Dorsal surface of anterior femora without spines.... ..... 2
- 2A. Metazona not much developed and not bulbous, remnants of tegminae not covered by the pronotum (Figs. 19–20). Distributed in Cuba .....*Polyancistroides*
- 2B. Metazona well-developed and markedly bulbous, remnants of tegminae covered by the pronotum. Distributed in Hispaniola ..... 3
- 3A. Pronotal margins marked by many small denticles (Figs. 13, 15)..... *Polyancistrus*
- 3B. Pronotal margins marked by few but large and sharp spines (Fig. 11).... .....  
.....*Tainacanthus* **gen. nov.**

#### DISCUSSION

The general shape and size of the pronotum in *Tainacanthus* appears most like that of *Polyancistrus*, suggesting that it may be its closest relative. *Spelaeala* and the Cuban *Polyancistroides* share the feature of a metazona that is not much extended backwards (Figs. 17–20). Future work will review the taxonomy of both *Polyancistrus* and *Spelaeala* additionally incorporating molecular data.

The evolutionary history of the Polyancistrini katydids is likely as complex as the geological history of the Caribbean landmasses in which they evolved. Having relatively isolated extant representatives in Mexico, Ecuador and Brazil, besides those in the Greater Antilles, indicates that the group probably had a greater diversity and wider geographic range in the past than at present. An ancestor Polyancistrini likely colonized the islands from Central or South America early

in the evolution of the Antillean archipelago. The island environment may have provided a refugium for these katydids, which free from the likely stronger competition and predation pressures experienced in the continent, eventually evolved into three genera in Hispaniola. The Greater Antilles as islands and Antillean faunal lineages are thought to be younger than Middle Eocene (about 35 million years old) (Iturralde-Vinent & MacPhee, 1999). The early terrestrial connection of northern Hispaniola to eastern Cuba during the Miocene must have led to the expansion of Polyancistrini into that island and the evolution of the Cuban genus *Polyancistroides*. A more detailed comparative study and a molecular phylogeny of the Polyancistrini would reveal the relationships within the Caribbean genera, the relationships to their relatives in the continental areas and possibly important details about the evolutionary history of the group.

The phenomenon of female to male communication via sounds in katydids does not seem to have been much explored although it appears to be common among pseudophyllines (Gwynne, 2001). This occurs in the Hispaniolan Polyancistrini and it is a phenomenon that deserves more attention.

The katydid fauna of Hispaniola is still not well-known. The checklist of Hispaniolan arthropods (Perez-Gelabert, 2008) included 22 species of Tettigoniidae classified into four subfamilies (Conocephalinae, Meconematinae, Phaneropterinae and Pseudophyllinae). Two additional species, *Erechthis gundlachi* Bolívar, a species shared with Cuba and *Pyrgocorypha uncinata* (Harris), also found in Cuba and the eastern United States, were among the last additions to the katydid fauna (Perez-Gelabert, 2014). The species *Erechthis ayiti* (De Luca & Morris, 2016), was later described from Haiti and the Dominican Republic. Most recently, Yong (2019) added two other species from Dominican Republic. Thus, including *Tainacanthus ferox* **gen. nov.**, **sp. nov.** only 28 species of Tettigoniidae have so far been recorded from Hispaniola, although the finding of several additional undescribed genera and species already shows that this fauna is much more diverse. Despite the extensive damage to the forests of Haiti, additional katydids will also be discovered in Haiti, where very few Orthoptera specimens have been collected. Targeted efforts are necessary to obtain specimens and characterize these rare taxa.

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