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## NEW COUNTRY RECORDS OF LEAF AND LONGHORN BEETLES (COLEOPTERA: CHRYSOMELOIDEA) COLLECTED IN THE TROGON TRAIL, PROVINCE OF COLON, PANAMA.

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**Foto de la portada**: *Platyphora haroldi* Baly, 1877. Panamá, Provincia de Colón, Achiote. 7 septiembre 2017 (foto Alonso Santos-Murgas).

# NEW COUNTRY RECORDS OF LEAF AND LONGHORN BEETLES (COLEOPTERA: CHRYSOMELOIDEA) COLLECTED IN THE TROGON TRAIL, PROVINCE OF COLON, PANAMA.

ALFREDO LANUZA-GARAY[1, 5, 6], LERIDA CHIRÚ[2], OSCAR LÓPEZ CHONG[4, 6] y ALONSO SANTOS-MURGAS[3, 5, 6]

## ABSTRACT

As result of entomological fieldwork undertaken in the Trogon trail, located to the south of San Lorenzo Protector Forest, Province of Colon, Panama, 107 species of leaf and longhorn beetles were sampled. In this work, we present a list of species collected, among them, recorded for first time, five species of leaf beetles and one species of longhorn beetle. These records contain useful information such each species diagnosis descriptions, habitat and some comments in addition of their previous geographical distribution to enhancing knowledge of these beetles in Panama.

**Key Words:** San Lorenzo Protector Forest, Chrysomelidae, Cerambycidae, Beetles, Diversity

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## RESUMEN

Como resultado de un muestreo entomológico realizado en el Sendero el Trogón, localizado en la parte sur del Bosque Protector San Lorenzo, Provincia de Colón, Panamá, se colectaron 107 especies de escarabajos longicornios y crisomélidos. En este trabajo se presenta un listado de las especies colectadas en el sitio, entre las que se registran por primera vez cinco especies de escarabajos de las hojas y una especie de escarabajos longicornios. Estos registros brindan valiosa información como descripciones diagnosticas de cada especie, hábitat y algunos comentarios, además de su distribución geográfica previa, aumentando el conocimiento sobre estos grupos de escarabajos en Panamá.

**Palabras claves:** Bosque Protector San Lorenzo, Chrysomelidae, Cerambycidae, Escarabajos, Diversidad

## INTRODUCTION

Central America's tropical forests are known for harboring a high diversity of insect species. Is for this reason that studies on insect in Mesoamerica have shifted from simple species surveys to more targeted and applicable goals such understand its ecology and behavior (Quintero and Aiello, 1992; Veijalainen *et al.*, 2014; Pimenta & DeMarco, 2015; Sanchez-Reyes *et al.*, 2016; Teles *et al.,* 2019). This situation promotes scientific interest, mainly focused on beetles' tropical biodiversity. Although different studies were conducted in recent years, such as Furth & Savini (1996); Basset (2001); Ødegaard (2003); Charles & Basset (2005); Furth (2005) and Lanuza-Garay & Barrios (2018), our knowledge about their real diversity and distribution across the Central American isthmus is feeble.

Leaf beetles (Chrysomelidae) are one of the most abundant and diverse families of living organisms with more than 30 000 species described worldwide (Santos Murgas *et al.*, 2018, Teles *et al.*, 2019). Whilst, Longhorn Beetles (Cerambycidae) constitutes one of the most diverse families of Coleoptera and largest group of xylophagous beetles, with approximately 30 000 identified species worldwide (Lanuza-Garay *et al.*, 2016; Hanson & Nishida, 2016; Lanuza-Garay & Barrios, 2018).

Distributional information of both Chrysomelidae and Cerambycidae published for the country, are limited to the eastern province of Darien, western region of Panama as well as the forested areas around the Panama Canal. Most of these records were cited in papers by Windsor (1987), Windsor *et al.* (1992), Corbett (2004), Lanuza-Garay and Vargas Cusatti (2011), Bezark *et al.* (2013), Sekerka (2014), Staines and Garcia-Robledo (2014), Lanuza-Garay and Barrios (2015), Morrison and Windsor (2017), Lanuza-Garay and Santos Murgas (2018, 2019).

The aim of the present faunistic paper is present new country records, including diagnostic description, habitat, temporal data and comments for a group of leaf and longhorn beetles from a tropical rainforest patch in the Caribbean side of Panama.

## MATERIALS AND METHODS

These present new records resulted from entomological samplings during two years (from October 2015 to October 2017), by the authors in the Trogon Trail, a tropical rainforest, located on Achiote Road to the south of San Lorenzo Protector Forest, one of the most important protected areas in the Caribbean side of Panama. The main purpose of this research were to take a beetle's biodiversity inventory, sampling in three areas with different degrees of anthropogenic interference. The areas are [1] a fifty years old late secondary rainforest; [2] a small coffee plantation and other crops such as bananas and [3] an area of intervened forest, a product of anthropogenic activities from the 1950s and later. Detailed information about these sampling sites could be found in CEASPA (2006).

In each sampling area, we installed a malaise trap, from which the insects were removed weekly. Beetles were transferred into jars at 70% of ethanol and later mounted on pins for subsequent study in the laboratory and stored in the insect collection of the Biology School of the Universidad de Panamá, Centro Regional Universitario de Colón (CRUC) and at the Museo de Invertebrados G.B. Fairchild of Universidad de Panamá (MIUP).

Leaf and longhorn beetles new records were identified to genus and species using Baly's keys and species descriptions (1886), Harold (1876), Bowditch (1915), Fisher (1947), Bechyné (1951), Scherer (1962, 1983), Chemsak and Linsley (1982), Rodrigues and Mermudes (2016) and Furth (2019). For Chrysomelidae and Cerambycidae geographical distribution information, we also looked literature concerning for each species and supplementary works such Blackwelder (1946), Wilcox (1970), Furth and Savini (1996) and Monné (2018)

## RESULTS AND DISCUSSION

In total, we collected 107 species (78 for Chrysomelidae, 1 for Megalopodidae and 28 for Cerambycidae) during our entomological surveys in the Trogon Trail (Table 1). Six of them are newly recorded species; five leaf beetles *Isotes serraticornis* (Baly, 1886), *Dircema cyanipenne* Bechyné, 1951, *Cerichrestus freidbergi* Furth, 2019, *Rhinotmetus trifasciatus* Bowditch, 1915, *Alagoasa*

*bipunctata* (Chevrolat, 1834) and one longhorn beetle *Oxylymma tuberculicolle* Fisher, 1947. Family-group nomenclature follows Furth and Savini (1996), Bouchard *et al.*, (2011) and Monné (2018). For distributional record information, see table 2.

**Table 1. List of Chrysomelidae, Megalopodidae and Cerambycidae species collected in the remnant of tropical humid forest studied.**
[*, new record of Country]

**CHRYSOMELIDAE - CASSIDINAE**
**MESOMPHALINI**
*Botanochara ordinata* (Boheman, 1850)

**CASSIDINI**
*Acromis sparsa* (Boheman, 1854)
*Agroinconota propinqua* (Boheman, 1855)
*Charidotella sexpuntata* (Fabricius, 1781)
*Charidotella ambita* (Champion, 1894)
*Chelymorpha alternans* (Boheman, 1854)
*Deloyala fuliginosa* (Olivier, 1790)
*Ischnocoidia annulus* (Fabricius, 1781)
*Microctenochira fraterna* (Boheman, 1855)
*Microctenochira infantula* (Boheman, 1862)
*Microctenochira lugubris* (Boheman, 1862)
*Microctenochira reticularis* (Degeer, 1775)

**IMATIDIINI**
*Aslamidium semicirculare* (Olivier, 1808)
*Imatidium thoracicum* Fabricius, 1801

**SPILOPHORINI**
*Calyptocephala brevicornis* Boheman, 1850
*Spilophoroides marginatus* (Weise, 1910)

**PROSOPODONTINI**
*Prosopodonta dorsata* (Baly, 1885)

**CHALEPINI**
*Oxychalepus normalis* (Chapuis, 1877)
*Sceloenopla scherezeri* (Baly, 1858)

**CHRYSOMELIDAE - GALERUCINAE**
**LUPERINI**
*Acalymma separatum* (Baly, 1886)
*Chthoneis jansoni* Jacoby, 1879
*Diabrotica godmani* Jacoby, 1887
*Diabrotica championi* Jacoby, 1887
*Diabrotica mitteri* Derunkov, Prado, Tishechkin, Konstantinov, 2015
*Diabrotica hartjei* Derunkov, Prado, Tishechkin, Konstantinov, 2015
*Diabrotica brevilineata* Jacoby, 1887
*Diabrotica tesselata* Jacoby, 1887
*Eccoptopsis denticornis* (Jacoby, 1887)
*Exora encaustica* Germar, 1824.
*Gynandrobrotica ventricosa* Jacoby 1878
*Isotes puella* (Baly, 1886)
*Isotes serraticornis* (Baly, 1886)*
*Paratriarius adonis* (Baly, 1859)
*Monolepta bipartita* (Jacoby, 1888)
*Monolepta panamensis* (Jacoby, 1888)
*Neobrotica caeruleofasciata* Jacoby, 1887
*Phyllobrotica* sp.

**GALERUCINI**
*Coelomera godmani* Jacoby 1879
*Dircema cyanipenne* Bechyné, 1951*

**ALTICINI**
*Acanthonycha championi* Bechyné, 1959
*Alagoasa decemguttatus* (Fabricius, 1801)
*Alagoasa godmani* (Jacoby, 1880)
*Alagoasa bipunctata* (Chevrolat, 1834)*
*Alagoasa montana* (Jacoby, 1886)
*Cerichrestus clarki* Jacoby, 1886
*Cerichrestus freidbergi* (Furth, 2019)
*Diphaulaca aulica* (Olivier, 1808)
*Disonycha trifasciata* Clark, 1865
*Heikertingeria* sp.
*Hydmosyne inclyta* Clark, 1860
*Monomacra chiriquensis* (Jacoby, 1884)
*Monomacra perplexa* (Jacoby, 1884)
*Omophoita albicollis* (Fabricius, 1787)
*Omophoita clerica* (Erichson, 1848)
*Physimerus* sp.
*Rhinotmetus trifasciatus* (Bowditch, 1815)*

*Stegnea chiriquensis* (Jacoby, 1885)
*Systena oberthuri* Baly, 1878
*Systena variabilis* Jacoby, 1884

**CHRYSOMELIDAE - EUMOLPINAE**
**EUMOLPINI**
*Allocolaspis grandicollis* (Blake, 1976)
*Deuteronoda suturalis* (Lefevre, 1878)
*Percolaspis pulchella* (Lefevre, 1877)
*Rhabdopterus fulvipes* (Jacoby, 1882)
*Rhabdopterus panamensis* (Blake, 1976)

**MEGASCELIDINI**
*Megascelis puella* Lacordaire, 1845

**CHRYSOMELIDAE - LAMPROSOMATINAE**
**LAMPROSOMATINI**
*Lamprosoma inornatus* Jacoby, 1878
*Oomorphus* sp.

**CHRYSOMELIDAE - CRIOCERINAE**
**LEMINI**
*Lema bicincta* Lacordaire, 1854
*Lema subapicalis* Baly, 1879
*Neolema dorsalis* (Olivier 1791)
*Oulema* sp.

**CHRYSOMELIDAE - CHRYSOMELINAE**
**CHRYSOMELINI**
*Calligrapha argus* Stål, 1859
*Leptinotarsa undecemlineata* Stål, 1859
*Platyphora haroldi* (Baly).
*Platyphora ligata* Stål, 1858
*Stilodes fuscolineata* Stål, 1865

**CHRYSOMELIDAE - BRUCHINAE**
**PACHYMERINI**
*Pachymerus cardo* (Fåhraeus, 1839)

**MEGALOPODIDAE**
*Megalopus* sp.

**CERAMBYCIDAE - LAMIINAE**
**ACANTHOCININI**
*Lagocheirus araneiformis* (Linnaeus, 1767)
*Lagocheirus plantaris* Dillon, 1957
*Leptostylus batesi* Casey, 1913
*Stenolis inclusa* (Bates, 1855)

**ACANTHODERINI**
*Oreodera costaricensis* Thomson, 1865

**ANISOSCERINI**
*Caciomorpha palliata* (White, 1855)

**APOMECYMINI**
*Adetus postilenatus* Bates, 1885

**COLOBOTHEINI**
*Colobothea dispersa* Bates 1872
*Colobothea distincta* Pascoe 1866
*Colobothea chontalensis* Bates 1872

**ONCIDERINI**
*Furona corniculata* (Bates, 1885)
*Thulcus thysbe* (Dillon & Dillon, 1945)

**DESMIPHORINI**
*Estola ignobilis* Bates, 1872

**PTEROPLIINI**
*Esthlogena porosa* Bates 1872

**HEMILOPHINI**
*Zeale scalaris* Pascoe, 1866

**CERAMBYCIDAE - CERAMBYCINAE**
**CERAMBYCINI**
*Juiaparus batus* (Linnaeus, 1758)

**HEXOPLONINI**
*Gnomilodon laetabila* Bates, 1885
*Hexoplon albipenne* Bates, 1872

**RHINOTRAGINI**
*Neothomasella igniventris* (Giesbert, 1991)
*Ommata elegans* White 1855
*Oxylymma tuberculicolle* Fisher, 1947*

**PTEROPLATINI**
*Deltosoma flavidum* Aurivillius, 1925

**TRACHYDERINI**
*Ceragenia insulana Fisher, 1943*
*Trachyderes succinctus* (Linnaeus, 1758)

**CLYTINI**
*Cotyclytus scenicus (Pascoe, 1866)*
*Mecometopus lathithorax* Martins & Galileo, 2008

**ELAPHIIDINI**
*Aneflus* (*Protaneflus*) *minutivestis* (Chemsak & Linsley, 1934)
*Anelaphus subseriatus* (Bates, 1885)

**Table 2. Distributional records of species of leaf and longhorn beetles.**

| Species | Mexico | Guatemala | Belize | Salvador | Costa Rica | Panama | Colombia | Venezuela | Ecuador | Peru |
|---|---|---|---|---|---|---|---|---|---|---|
| *Alagoasa bipunctata* | X | X | X | X | X | X* | | | | |
| *Cerichrestus freidbergi* | | | | | X | X* | | | | |
| *Rhinotmetus trifasciatus* | | | | | | X* | | | X | |
| *Isotes serraticornis* | | | | | | X* | X | X | | |
| *Dircema cyanipenne* | | | | | | X* | | | | X |
| *Oxylymma tuberculicolle* | | | | | X | X* | | | | |

* new record of Country, see text for details.

**Family Chrysomelidae**
**Subfamily Galerucinae**
**Tribe Luperini**
**Genus *Isotes***
***Isotes serraticornis* (Baly, 1886)**
**(Fig. 1)**

*Diagnosis:* Integument and antennae yellowish brown, head reddish brown, scutellum black. Head longer than broad, triangular, front with a longitudinal groove; clypeus with a faint longitudinal ridge. Antennae with the second antenommere short, III equal in length to the first, clavate, its apex obliquely truncate, IV-V trigonate, serrate-shaped, equal, VI nearly equal in length to the third, clavate, VII to XI filiform shape. Pronotum 2.2 times wider than longer; sides slightly rounded, obliquely diverging from the base to the middle. Elytra much broader than the thorax, convex, the outer limb narrowly dilated; surface finely punctured with four black maculae. *Comments: I. serraticornis* differs to other species of *Isotes* recorded previously in Panama (*I. puella*, *I. dilatata* and *I. uniformis*) mainly in the shape of antennomers, tegument color and presence of multiple maculae in the elytra. This record represents most northerly record for the species.

*Material examined:* PANAMA [*Colon, Trogon Trail, late secondary forest*] 1 male, 27-I-2016 (A. Lanuza-Garay, A. Santos, O. López-Chong) (MIUP); 3 males, 17-23-X-2017 (A. Lanuza-Garay, A. Santos, O. López-Chong) (CRUC).

*New Record:* Panama

*Previous record:* Colombia and Venezuela (Baly, 1886).

**Tribe Galerucini**
**Genus *Dircema***
***Dircema cyanipenne* Bechyné, 1951**
**(Fig. 2)**

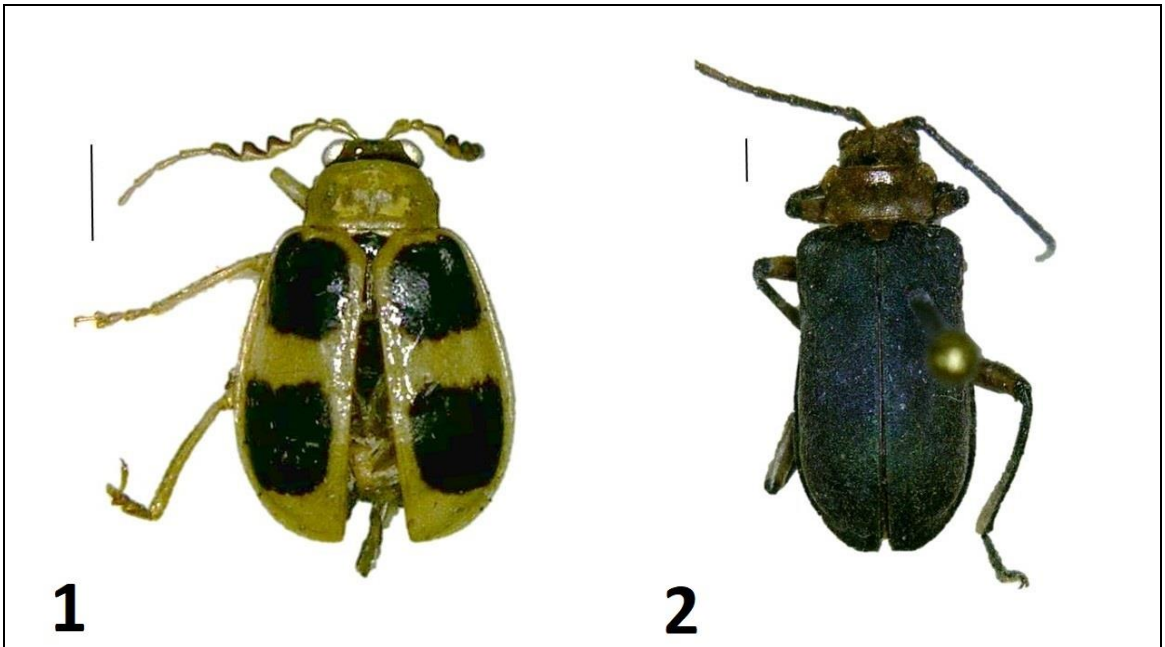
*Diagnosis:* Integument brown, antennae black with last four antennal segments yellowish. Elytra dark metallic blue, uniformly colored, prothorax and scutellum shiny, punctuated, elytra opaque, finely punctuated and grainy. Last abdominal segment of the female deeply and closely indented. Apex of femora, tibiae and tarsi blackish. *D. cyanipenne* differs another species of *Dircema* previously recorded in the country such *D. columbicum* and *D. laetum* by the absent of elytral suture and margins yellowish; on the other hand, *D. cyanipenne* resemble *D. nigripenne*, but, in the latter, the head, antennae and elytra are black and last four antennal segments not yellowish. *Comments: D. cyanipenne* represent first record of the species in Central

American region and we would not be surprised, new records of this beetle found in most northerly South American countries in the future.

*Material examined:* PANAMA [*Colon, Trogon Trail, late secondary forest] 1 specimen,* 27-XI-2015 (A. Lanuza-Garay, A. Santos, O. López-Chong) (MIUP).

*New Record*: Panama

*Previous record:* Peru (Bechyné, 1951).




**Figuras 1-2**: 1. *Isotes serraticornis*, 2. *Dircema cyanipenne*. Scale bars= 10 mm.

**Tribe Alticini**
**Genus *Cerichrestus***
***Cerichrestus freidbergi* Furth, 2019**
**(Fig. 3)**

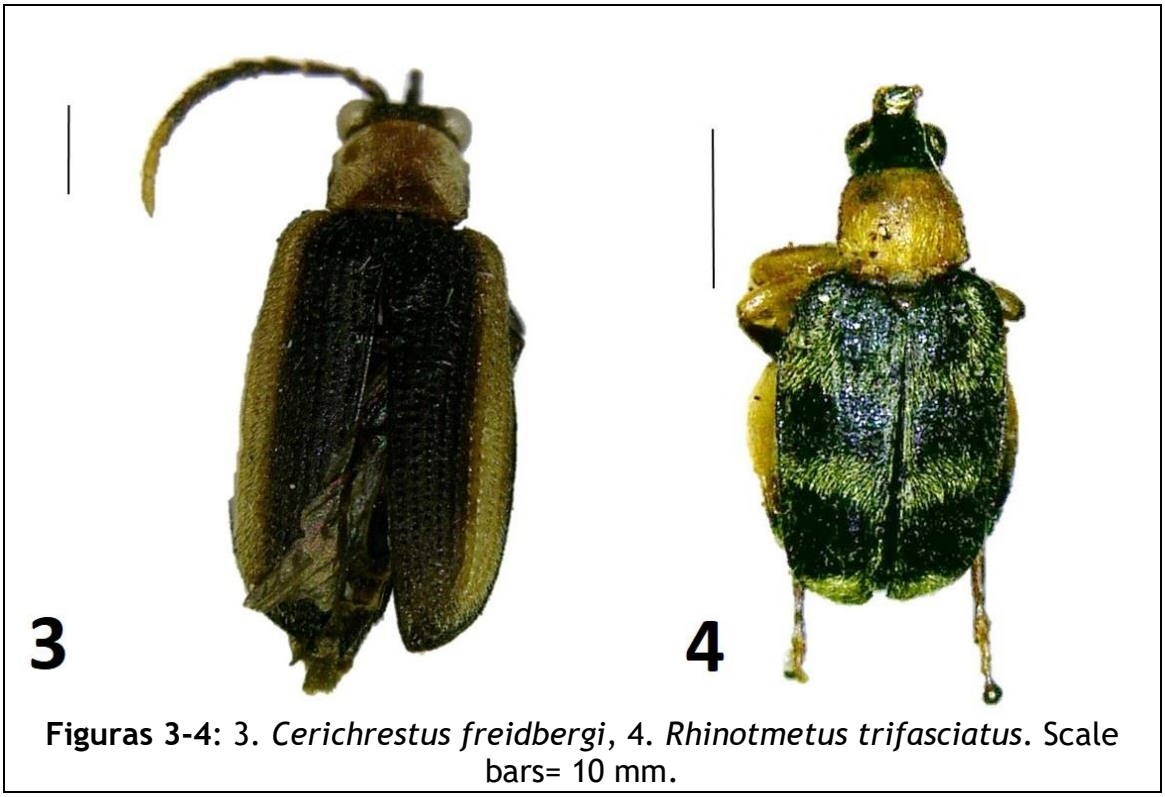
**Diagnosis:** *Cerichrestus freidbergi,* differs from *Cerichrestus clarki* previously recorded in Panama and Costa Rica, primarily because in *C. freidbergi,* the pronotal stripe is lighter in color, hour-glass-shaped and created by the arrangement of pubescence. Elytra in *C. freidbergi* blackish centrally with sublateral, longitudinal, yellow/orange stripe; meanwhile in *C. clarki* elytral black pattern is presented, slightly tapered towards elytral base with a broad median stripe/spot on the apical half.

*Material examined:* PANAMA [Colon, Trogon Trail, late secondary forest] 1 specimen, 27-I-2016 (A. Lanuza-Garay, A. Santos, O. López-Chong) (MIUP).

*New record:* Panama

*Previous record:* Costa Rica (Furth, 2019).

*Comment:* In another survey, first author found an unknown specimen of *Cerichrestus* feeding on leaves of *Phyllodendron* (Araceae) in a Secondary Forest habitat, with the same characteristics and plant composition such the site where we collected *C. freidbergi* and *C. clarki,* so we suspect this could be its host plant.




**Figuras 3-4**: 3. *Cerichrestus freidbergi*, 4. *Rhinotmetus trifasciatus*. Scale bars= 10 mm.

**Genus *Rhinotmetus***
***Rhinotmetus trifasciatus* (Bowditch, 1915)**
**(Fig. 4)**

*Diagnosis:* head, thorax and legs more or less brightly yellow, elytra black with three transverse bands of yellow pubescence, ante, post median and apical region, the former with a branch encircling the shoulder and all attaining the margin, the suture also narrowly pubescent. *Comments:* This is an unusual record, like *Dircema cyanipenne*, because his original distribution occurs in

meridional South American countries such Peru and Equator, far from Panama; *Rhinotmetus* is represented by three species for the country: *albopilosus* (Jacoby, 1886), *flavovittatus* Jacoby 1886 and *parvulus* Jacoby, 1886. However, characters present in these species differs from our specimen, we consider this is a "forgotten" genus is that there are no literature citations since Jacoby (1886), Bowditch (1915) and Furth (1996).

*Material examined:* PANAMA [*Colon, Trogon Trail, late secondary forest*] 1 specimen, 14-X-2016 (A. Lanuza-Garay, A. Santos, O. López-Chong) (MIUP).

*New record:* Panama
*Previous record*: Equator (Bowditch 1915).

**Genus *Alagoasa***
***Alagoasa bipunctata* (Chevrolat, 1834)**
**(Fig. 5 & 6)**

*Diagnosis: Alagoasa bipunctata* has about six well-documented intraspecific variations, with coloration variants and different elytral design patterns (Jacoby 1886; Bechyné and Bechyné, 1963). In this study, we observed a case of extreme sexual dimorphism, where male showed elytra with 10 brownish yellow maculae, meanwhile female with four pale brown longitudinal stripes. *Comments:* This is an expected record, taking into consideration the previous distribution of the species throughout the Mesoamerican region, and multiple informal records, though platforms such as iNaturalist.

*Material examined:* PANAMA [*Colon, Trogon Trail, late secondary forest*] 2 specimens; 27-X-2016 (A. Lanuza-Garay, A. Santos Murgas, O. López Chong) (CRUC) (1 male); 30-X-2015 (A. Lanuza-Garay, A. Santos Murgas, O. López Chong) (1 female) (MIUP).

*New record:* Panama

*Previous record:* Mexico Belize, El Salvador, Guatemala, Costa Rica (Jacoby 1886; Bechyné and Bechyné 1963; Furth and Savini, 1996).


**Figuras 5-6**: 5. *Alagoasa bipunctata*, 6. *Alagoasa bipunctata*. Scale bars= 10 mm.

**Family Cerambycidae**
**Subfamily Cerambycinae**
**Tribe Rhinotragini**
**Genus *Oxylymma***
***Oxylymma tuberculicolle* (Fisher, 1947)**
**(Fig. 7)**

*Diagnosis:* Integument yellowish, except head black and prothorax orange, with a conical tubercle in the middle of pronotal disk, elytra with transverse black maculae around the humeral angle, two yellowish maculae within, and below the middle of elytra. *Comments:* this is the Southerly record of the species, although other species of *Oxylymma* are known for Panama (*O.caeruleocincta*), *O. tuberculicollis* is easy to recognize by the pronotal tubercle and habitus.

**Material examined:** PANAMA [Colon, Trogon Trail, coffee-growing zone] 1 specimen, 13-V-2016 (A. Lanuza-Garay, A. Santos Murgas, O. López Chong) (MIUP).

*New record:* Panama
*Previous record:* Costa Rica (Fisher, 1947, Monné, 2018).

**Figure 7**: *Oxylymma tuberculicolle* habitus: dorsal view, frontal view, lateral view. Scale bar= 10mm.

El Trogon Trail leaf and longhorn beetles fauna collected during entomological survey (Lanuza-Garay *et al.*, 2020 unpublished data) is notably similar to that of the adjacent portions (Basset, 2001; Charles and Basset, 2005). Nevertheless, the present new records do considerably expand both of their known geographic ranges in tropical America and demonstrates the requirement more taxonomic research to understanding the biodiversity in Panama.

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## LITERATURE CITED

**Baly, J.S. 1886.** The Colombian Species of the Genus *Diabrotica*, with Description of those Hitherto Uncharacterized-Part II. Journal of the Linnean Society of London, Zoology, 19 (113): 230-259.

**Basset, Y. 2001.** Communities of Insect Herbivores Foraging in Sapling versus Mature Trees of *Pourouma bicolor* (Cecropiaceae) in Panama. Oecologia 129: 253-260.

**Bezark, L G, Tyson, W H, Schiff, N M. 2013.** New species of Cerambycidae from Panama, with new distribution records (Coleoptera: Cerambycidae). Zootaxa 3608 (4): 273–277.

**Bechyné, J. 1951.** Chrysomeloidea Americains Noveaux ou Peu Connus (Coleoptera). Revista Chilena de Entomologia 1 : 75-112.

**Bechyné, J. & Bechyné, B. S. 1963.** Beitrag zur Kenntnis der Salvadorenischen Chrysomeloidea (Col. Phytophaga). Iheringia Zool. No.31: l-79.

**Bouchard, P., Bousquet, Y., Davies, A. E., Alonso-Zarazaga, M.A., Lawrence, J.F., Lyal, C.H.C., Newton, A.F., Reid, C.A.M., Schmitt, M., Ślipiński, S.A. & Smith, A.B.T. 2011.** Family-group names in Coleoptera (Insecta). Zookeys, 88: 1-972.

**Bowditch, F.D. 1915.** Notes on Some South American Halticidae. Transactions of the American Entomological Society. 41(4): 487-508.

**Charles, E. & Basset. Y. 2005**. Vertical Stratification of Leaf Beetles Assemblages (Coleoptera: Chrysomelidae) in Two Forest Types in Panama. Journal of Tropical Ecology, 21: 329-336.

**Corbett, D.C. 2004.** Sinopse do Gênero *Cobelura* (Coleoptera, Cerambycidae, Lamiinae, Acanthocinini) com Descrição de três espécies novas. Iheringia, Serie Zoológica 94 (3): 277-280.

**Fisher, W.S. 1947.** New Cerambycid Beetles Belonging to the Tribe Rhinotragini. Proceedings of the United States National Museum. 97 (3209): 47-47

**Furth, D.G. y Savini, V. 1996.** Checklist of the Alticinae of Central America, including Mexico (Coleoptera: Chrysomelidae). Insecta Mundi 10 (1-4): 45-68.

**Furth D.G. 2005.** The Current Status of Knowledge of the Alticinae of Mexico (Coleoptera: Chrysomelidae). *Bonner Zoologische Beiträge* 54: 209-237

**Furth, D.G. 2019**. A new Species of the Neotropical Mimetic genus *Cerichrestus* Clark, from Costa Rica (Coleoptera: Chrysomelidae: Alticinae): An Example of how unknown is biodiversity. Israel Journal of Entomology, 49(2): 179-194.

**Hanson, P.E. & K. Nishida. 2016.** Insects and Other Arthropods of Tropical America. Zona Tropical Publications, Cornell University Press.

**Harold, E, von. 1876.** Beitrage zur Kenntnis der Fauna von Neu-Granada. (Halticinae II). Coleopt. Hefte. 15: 1-36.

**Jacoby, M. 1886**. Biologia Centrali-Americana, Insects, Coleoptera, Galerucidae. 6(1):409-496.

**Lanuza-Garay, A. & Vargas Cusatti, U. 2011.** Escarabajos Saproxilicos (Hexapoda, Coleoptera) en un Bosque Húmedo Tropical: Diversidad y Abundancia. Boletín del Museo de Entomología de la Universidad del Valle 12(2): 19-25

**Lanuza-Garay, A. & Barrios, H. 2015.** Plantas Hospederas de Cerambycidae (Coleoptera: Chrysomeloidea) del Paisaje Protegido de Isla Galeta, Colón, Panamá. Scientia 25(2): 63-71

**Lanuza-Garay, A. & Barrios, H. 2018.** Host Specificity and Wood Density based Host Choice by Longhorn Beetles (Coleoptera: Cerambycidae) in a Panamanian Lowland Rainforest. The Coleopterists Bulletin 72(3): 590-596.

**Lanuza-Garay, A. & Santos Murgas, A. 2018**. Escarabajos Longicornios (Coleoptera: Cerambycidae y Disteniidae) del Parque Nacional Darién, Panamá. Insecta Mundi 0633: 1-12.

**Lanuza-Garay, A, Herrera, D, Marin, M, & Santos Murgas, A. 2016.** The Genus *Criodion* (Audinet-Serville, 1833) (Coleoptera: Cerambycidae) First Record for Panama. Biodiversity Data Journal

**Monné, N. 2018.** Catalogue of the Cerambycidae (Coleoptera) of the Neotropical Region. Part I. Subfamily Cerambycinae. Available from cerambyxcat@com/Part 1 Cerambycinae. pdf

**Morrison, C. R. & Windsor, D.M. 2017.** The Life Story of *Chelymorpha alternans* (Coleoptera: Chrysomelidae: Cassidinae) in Panamá. Annals of the Entomological Society of America, 111 (1): 31-41.

**Ødegaard, F. 2003.** Taxonomic Composition and Host Specificity of Phytophagous Beetles in a Dry Forest in Panama. Pp. 220- 236. In Basset, Y, Kitching, R, Miller, S, Novotny, V. Arthropods of Tropical Forest: Spatio-Temporal Dynamics and Resource Use in the Canopy. Cambridge University Press

**Pimenta, M. & De-Marco, P. 2015.** Leaf beetle (Chrysomelidae: Coleoptera) assemblages in a mosaic of natural and altered areas in the Brazilian Cerrado. Neotropical Entomology, 44: 242–255.

**Quintero, D. & Aiello, A. (Eds.) (1992).** Insects of Panama and Mesoamerica. Selected Studies. Oxford University Press

**Rodríguez, J.M.S. & Mermudes, J.R.M. 2016.** New records and distributional notes for the Neotropical genus *Isotes* Weise, 1922 (Insecta, Coleoptera, Chrysomelidae, Galerucinae). Checklist, 12(1): 1-12.

**Sánchez-Reyes, U. J., Niño-Maldonado, S., Meléndez-Jaramillo, E., Gómez-Moreno, V. del C. & Banda-Hernández, J. E. 2015.** Riqueza de Chrysomelidae (Coleoptera) en el Cerro El Diente, San Carlos, Tamaulipas, México. Acta Zoológica Mexicana (n. s.), 31(1): 10-22.

**Santos Murgas, A, Lanuza-Garay, A, & Carranza R, R E. 2019.** Biología de las Larvas del Escarabajo *Coelomera cajennensis* Fabricius, 1787 (Coleoptera: Chrysomelidae) En Panamá. Revista Nicaragüense de Entomología, 146: 1-13.

**Santos Murgas, A, Abrego, J. C. & Lanuza-Garay, A. 2019.** Aspectos Biológicos de *Terpsis quadrivitata* Champion, 1893 (Chrysomelidae: Cassidinae: Mesomphalini) en el Parque Nacional Altos de Campana, Provincia de Panamá Oeste, Panamá. Revista Centros 8(2): 1-9

**Scherer, G. 1962.** Bestimmungsschluessel der Neotropischen Alticinen-Genera (Coleoptera: Chrysomelidae: Alticinae). *Entomologische Arbeiten aus dem Museum G. Frey* **132**: 497–607.

**Scherer, G. 1983.** Diagnostic key for the Neotropical Alticine Genera (Coleoptera: Chrysomelidae: Alticinae). *Entomologische Arbeiten aus dem Museum G. Frey* **31/32**: 1–89. [English translation of Scherer 1962].

**Sekerka, L. 2014.** Review of Imatidiini genera (Coleoptera: Chrysomelidae: Cassidinae). Acta Entomologica Musei Nationalis Pragae, 54(1): 257–314

**Staines C. L. & García-Robledo C. 2014.** The genus *Cephaloleia* Chevrolat, 1836 (Coleoptera, Chrysomelidae, Cassidinae). ZooKeys 436: 1–355.

**Teles, T. S., Ribeiro, D. B., Raizer, J. & Linzmeier, A.M. 2019.** Richness of Chrysomelidae (Coleoptera) Depends on the Area and Habitat Structure in Semideciduous Forest Remnants. Iheringia, 109: 1-8.

**Veijalainen, A., Sääksjärvi, I. E., Tuomisto, H., Broad, G. R. Bordera, S. & Jussila, R. 2014.** Altitudinald Trends in Species Richness and Diversity or Mesoamerican Parasitoid Wasp (Hymenoptera; Ichneumonidae). Insect Conservation and Diversity 7(6):496-507.

**Windsor, D.M. 1987.** Natural History of a Subsocial Tortoise Beetle *Acromis sparsa* Boheman (Chrysomelidae: Cassidinae) in Panama. Psyche 94(1-2): 127-150.

**Windsor, D.M., Riley, E.G. & Stockwell, H. P. 1992.** An Introduction to the Biology and Systematics of Panamanian Tortoise Beetles (Coleoptera: Chrysomelidae: Cassidinae). In Quintero, D. & Aiello, A. (Eds.) Insects of Panama and Mesoamerica. Selected Studies. Oxford University Press, 962 pp. 372-391.

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