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Description of a new Mexican endemic subgenus of *Strigoderma* Burmeister with six new species (Coleoptera, Melolonthidae, Anomalini)

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Abstract. A new subgenus of the genus *Strigoderma* Burmeister, 1844, *Costatergus* Ramírez-Ponce & Andalco-Cid subgen. nov., is proposed to accommodate *S. costulipennis* Bates, 1888, and *S. tenebrosa* Delgado & Mora-Aguilar, 2012, as well as six other unpublished species, which are characterized by finely tumescent elytra with notable longitudinal ridges: *Strigoderma* (*Costatergus*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., *S.* (*C.*) *julianii* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., *S.* (*C.*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., *S.* (*C.*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., *S.* (*C.*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., *S.* (*C.*) *borealis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov. At the species level, the most important diagnostic characters are highlighted, concentrated in the shape of the inner protarsal claw, the punctation of the pronotum, the pattern of the elytral ridges and the simple genitalia. The subgenus *Costatergus* is endemic to Mexico, with a clear Typical Neotropical Distribution Pattern on the Mexican Pacific slope.

Keywords. Scarab beetles, shining leaf chafers, new subgenus, neotropics, diversity, classification, taxonomy, Neotropical distributional pattern.

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Introduction

The genus *Strigoderma* Burmeister, 1844 is endemic to America, distributed from Canada to Argentina (Jameson *et al*. 2003). Adults are diurnal and mainly anthophilous, while the larvae are saprorhizophagous and sometimes of agricultural importance (Morón *et al*. 1997; Cuate-Mozo *et al*. 2014). The only revision of the genus reports 28 valid species (Bader 1992), with three additional species described subsequently (Katbeh-Bader 2000; Delgado & Mora-Aguilar 2012; Ramírez-Ponce & Curoe 2014). Of these, 19 are present in Mexico, including 11 endemics (Bader 1992; Morón *et al*. 1997; Delgado & Mora-Aguilar 2012).

Species of this genus have been classified based on characters of external morphology (Bates 1888; Nonfried 1893; Casey 1915; Machatschke 1957, 1972; Bader 1992). However, these classifications have been inconsistent with one another due to the assessment of different structures and unequal geographical scopes. This is the case with *Strigoderma costulipennis* Bates, 1888, which was originally described and classified separately from the rest of the species of the genus based on its uniquely acute elytral costae ("*elytra acute costulata*") (Bates 1888: 260). In subsequent classifications, it was linked to multiple species, considering, for example, the pronotum and number of costal stripes, placing it together with *S. costulata* Nonfried, 1893 for having 8 costal stripes (Nonfried 1893). Two important works on the supraspecific systematics of the genus *Strigoderma* and the tribe Anomalini Peringuey, 1902 were the worldwide catalogues by Machatschke (1957, 1972), although his classification lacked explicit morphological criteria, the groups were highly heterogeneous. This suggests that he may relied on homoplastic traits, for example the body size. For instance *S. costulipennis* was placed in the *Pygmaea* group (inflection of *pygmaeus*; short or reduced height) along with the following species: *S. floricola* Ohaus, 1908, *S. haenschi* Ohaus, 1902, *S. intermedia* Bates, 1888, *S. marginata* Olivier, 1789, *S. mexicana* Blanchard, 1851, *S. peruviensis* Blanchard, 1851, *S. protea* Burmeister, 1844, *S. pygmaea* Fabricius, 1798, *S. rothschildi* Nonfried, 1893, *S. rutelina* Bates, 1888, *S. teapensis* Bates, 1888 and *S. villosella* Blanchard, 1851. The latter species was transferred to the genus *Lamoana* Casey, 1915 (Casey 1915; Madrigal *et al*. 2023), and all these species are widely heterogeneous in external and internal morphology. In the only revision of the genus, Bader (1992) proposed a new supraspecific grouping based on different morphological characters and erected the *Costulipennis* group, comprising *S. costulipennis* and *S. tomentosa* Bates, 1888, based on their granular elytral surface, while ignoring the presence of the elytral ridges.

As part of a long-term project on the systematics of the tribe Anomalini, numerous specimens in institutional and private collections from various countries have been examined, allowing a better understanding of the taxonomic importance of many previously proposed characters and their limitations, thereby facilitating the proposal of taxa supported by stronger hypotheses of homology. The aim of this paper is to propose a new subgenus for *Strigoderma*, and describe six new species with similar elytral ridges, raised here as homologous with each other. Additionally, a lectotype is designated for the type species of the genus.

Material and methods

A total of 36 specimens determined as or related to *S. costulipennis* were reviewed, from the following institutions:

ARPC = Andrés Ramírez Ponce Collection, Veracruz, Mexico
BMNH = Natural History Museum, London, England (Max Barclay and Malcolm Kerley)
CNHM = Zoological Collection of Insects, The Field Museum of Natural History, Chicago, United States (Crystal Anne Maier)
CNIN = National Insect Collection of the Institute of Biology, Universidad Nacional Autónoma de México, Mexico (Alejandro Zaldívar Riverón)
EMEC = Essig Museum of Entomology, University of California, Berkeley, USA (Roberta L. Brett)
IEXA = Entomological Collection of the Institute of Ecology, Xalapa, Mexico (Viridiana Vega Vadillo)
TAMU = The Texas A&M University Insect Collection, Texas, USA (Karen Wright)
UNSM = University of Nebraska State Museum, Nebraska, USA (M.J. Paulsen)
USNM = Smithsonian Institution, National Museum of Natural History (currently NMNH), Washington D.C., USA

Species concept

We used the phylogenetic species concept proposed by Wheeler & Platnick (2000), defined as "The species is the smallest aggregation of populations or lineages diagnosable by a unique combination of characters."

Character selection and taxonomic criteria

Morphological characters traditionally used throughout the history of the genus were selected, such as the shape of elytra, the number of elytral striae, type of punctures and elytral coloration (Blanchard 1851; Bates 1888; Casey 1915; Bader 1992), the form and puncture of the pronotum (Nonfried 1893; Bader 1992), the shape of the clypeus and its elevation (Burmeister 1844; Bader 1992), and the shape of the male genitalia (Bader 1992). The description and numeration of the elytral ridges and striae follows the order of Lu *et al.* (2018). The morphological criterion follows the one used by Casey (1915) and Bader (1992), and the definition of the genus and the supraspecific systematics conform to that used by Ramírez-Ponce & Morón (2009).

Preparation of specimens

For the analysis of internal morphology, the specimens were rehydrated in boiling water for approximately 10 min. The male genitalia were obtained by opening the anal plate and dry-mounted following the proposal of Ohaus (1934).

Data from the labels of the examined specimens are cited verbatim between quotation marks (""), a double slash (//) is used to separate different labels attached to the same specimen, and additional information and corrections are provided between square brackets ([]).

Edition of maps and figures

The specimens and structures were photographed and digitized with a Carl Zeiss AXIO Zoom V. 16 multifocal stereo microscope with an Axiocam camera model 506, as well as with a Nikon SMZ25 stereo microscope and a camera DS-Fi2 coupled with the Nikon NIS-Elements Imaging software. The plates were assembled in Adobe Photoshop CS6 (Adobe Systems Inc. San José California). The map base was created by the SimpleMappr website (Shorthouse 2010) and edited in Adobe Photoshop CS6.

Results

Key to adult males of species of Strigoderma of the subgenus Costatergus subgen. nov.

1. Elytra with the two outermost elevated ridges converging in the apical third to form a single ridge (Figs 1A, E, G, 4A, E, G) 2
– Elytra with the two outermost elevated ridges, not united into a single ridge in the apical third (Figs 1B–D, F, H, 2B–D, F, H) 4

2. Elytra with eight elevated ridges (Figs 3A, 4A, 12A). Protibia (Fig. 12F) and 5th protarsomere thinned (Fig. 12E); inner denticle of distal protarsomere barely noticeable (Fig. 12E). Colima .... ***S.* (*C.*) *vulcanica*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
– Elytra with nine or ten elevated ridges (Figs 3A, E, 4A, E). Protibia (Fig. 10F) and 5th protarsomere thickened (Fig. 10E); internal denticle of distal protarsomere notable (Fig. 10E); internal protarsal claw with lower ramus half the length of upper ramus (Fig. 10E) 3

3. Elytra with nine elevated ridges (Figs 3A, 4A, 6A). Parameres narrow, distinctly narrowed preapically, with straight apex (Fig. 6H–I). Guerrero ..... ***S.* (*C.*) *costulipennis*** Bates, 1888
– Elytra with 10 elevated ridges (Figs 3E, 4E, 10A). Parameres very broad, with the apex very widened (Fig. 10H–I). Guerrero ..... ***S.* (*C.*) *grossipenis*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.

4. Elytra with inter-ridge space clearly punctate and irregular (Fig. 3C, F). Elytral ridges with rounded edge (Fig. 4C, F) 5
– Elytra with inter-ridge space not punctate, with uniform appearance (Fig. 3B, H). Elytral ridges with sharp edge (Fig. 4B, H) 6

5. Pronotum dense and finely punctate (Fig. 2N). Inner protarsal claw simple (Fig. 11E). Parameres elongate and thin, with lateral edges narrowed preapically (Fig. 11I). Guerrero .... ***S.* (*C.*) *uniungula*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
– Pronotum with heterogeneous punctation, not very dense (Fig. 2K). Internal claw widely cleft (Fig. 8E). Parameres moderately elongated, with straight, robust lateral edges (Fig. 8I). Chiapas ... . ***S.* (*C.*) *paucipunctata*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.

6. Pronotum as long as wide, subtrapezoidal; anterior angles short, not projecting (Fig. 2P). Inner protarsal claw narrowly notched; lower ramus reaching slightly more than halfway up upper ramus (Fig. 13E). Parameres short and broad (Fig. 13I). Nayarit .... ***S.* (*C.*) *borealis*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
– Pronotum longer than wide, subrectangular; anterior angles projecting (Fig. 2J, L). Inner protarsal claw broadly notched (Figs 7E, 9E); lower ramus shorter than half of upper ramus. Parameres long and slender (Figs 7I, 9I) 7

7. Elytra with second elevated ridge marked throughout (Figs 3B, 7A). Elytra with lateral margin not thickened (Fig. 4B). Metatibia with very broad and dense punctation (Fig. 7B). Chiapas .... ***S.* (*C.*) *tenebrosa*** Delgado & Mora-Aguilar, 2012
– Elytra with diffuse second elevated ridge in the middle part (Figs 3D, 9A). Elytra with lateral margin thickened like a ridge (Fig. 4D). Metatibia with small, sparse punctation (Fig. 9B). Oaxaca .... ***S.* (*C.*) *juliani*** Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.

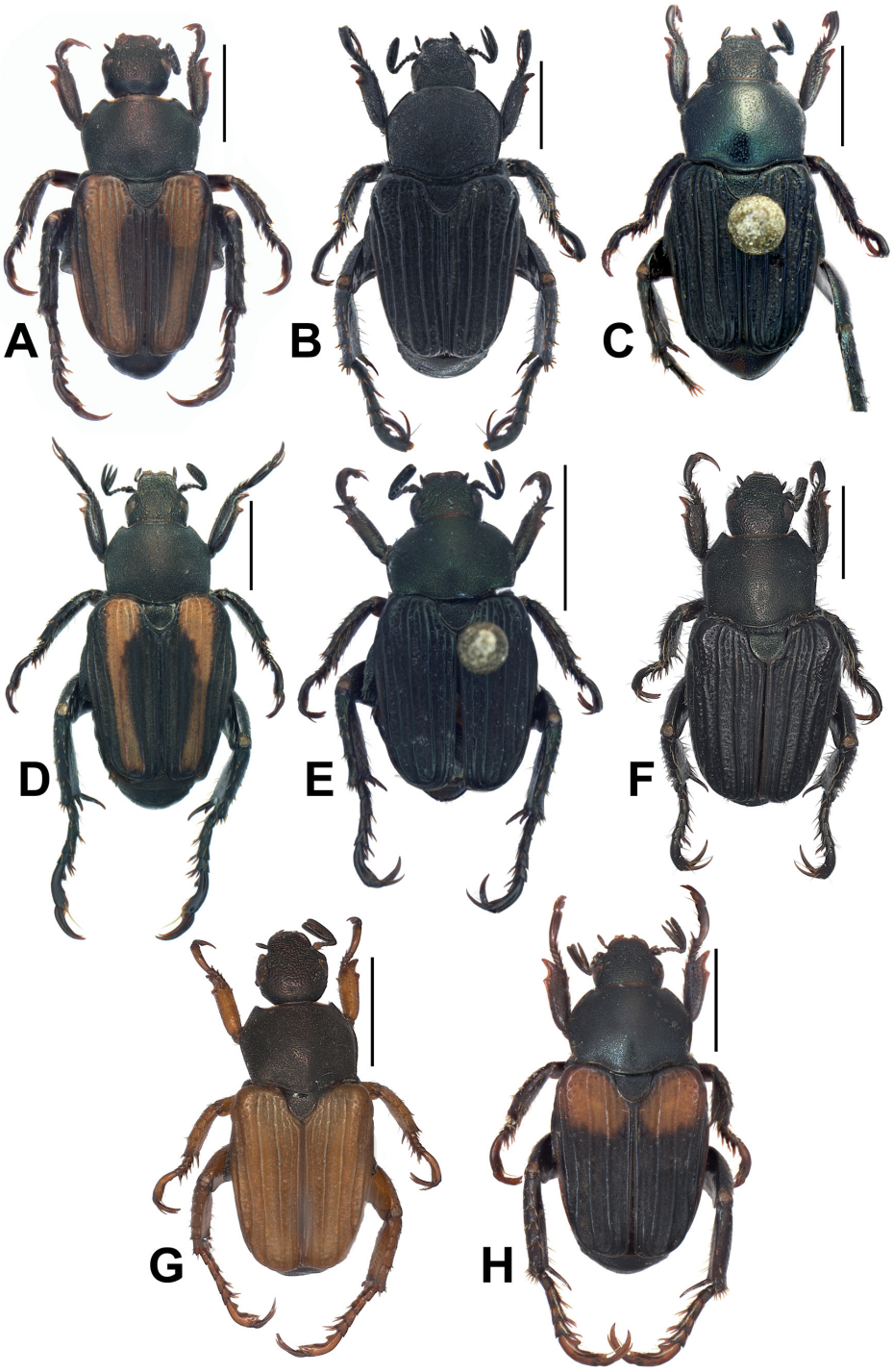

Fig. 1. Habitus in dorsal view of the subgenus *Strigoderma* (*Costatergus*) spp. **A**. *S.* (*C.*) *costulipennis* Bates, 1888, ♂ (EMEC). **B**. *S.* (*C.*) *tenebrosa* Delgado & Mora-Aguilar, 2012, paratype, ♂ (IEXA). **C**. *S.* (*C.*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **D**. *S.* (*C.*) *juliani* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (UNSM). **E**. *S.* (*C.*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **F**. *S.* (*C.*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **G**. *S.* (*C.*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **H**. *S.* (*C.*) *borealis* Andalco-Cid & Ramírez-Ponce s subgen. et p. nov., holotype, ♂ (EMEC). Scale bars = 2 mm.

Taxonomic treatment

Class Insecta Linnaeus, 1758
Order Coleoptera Linnaeus, 1758
Family Melolonthidae Samouelle, 1819
Subfamily Rutelinae MacLeay, 1819
Tribe Anomalini Peringuey, 1902
Genus *Strigoderma* Burmeister, 1844

Subgenus ***Costatergus*** Ramírez-Ponce & Andalco-Cid subgen. nov.
urn:lsid:zoobank.org:act:84F27E0F-F45D-44CB-A830-D1E8AF17F391
Figs 1–14

Type species

Strigoderma costulipennis Bates, l888: 260, by present designation.

Diagnosis

Elongated body (Fig. 1). Frons and clypeus roughly-punctate (Fig. 2A–H). Pronotum finely punctate (Fig. 2I–P). Elytra with 5–10 longitudinal ridges notably raised; intercostal area finely tomentose (Figs 3–4). Humeral callus extending laterally to the outer margin, interrupting the epipleura (Figs 6B to 12B). Inner protarsal claw with the upper ramus very long and pointed (Figs 6E to 12E). Parameres with the apex dorsoventrally depressed, rounded apex (Figs 6G–I, 12G–I).

Etymology

From the Latin '*costa*' ('ridge') and '*tergum*' ('back' or 'spine'), in reference to the prominent elytral ridges, diagnostic for this subgenus.

Variation

Slightly evident mainly in the puncture density on head, pronotum and pygidium. Noticeable in the coloration, where species with yellow tones on the elytra have varying degrees of dark spots, which may be absent (completely yellow elytra), in addition to melanic specimens.

Sexual dimorphism

Females exhibit marked dimorphism in antennae, elytra, and front legs. Antennae with antennal club approximately 1/4 to 1/5 shorter. Elytra with external ridge and epipleura very widened. Protibia with distal denticle longer and curved; protarsomeres thinner, with proximal tarsomere longer than the three subsequent ones; internal protarsal claw with upper and lower ramus of similar thickness, almost equal length. Females generally with slightly less deep and dense punctation on head and pronotum.

Distribution

The species of this subgenus have a distribution mainly on the Pacific slope, between Chiapas and Sinaloa, with penetration towards the centre of the country in Guerrero and Morelos, in plant communities of deciduous tropical forest and corn plantations, located from sea level to 1300 m a.s.l., with records for the states of Chiapas, Colima, Guerrero, Oaxaca, Morelos and Sinaloa. This distribution fits well with the Typical Neotropical Distribution Pattern with high level of penetration, as described by Halffter (1964, 1974, 1976) and reviewed by Halffter & Morrone (2017), whose species have occupied Mexico through the tropical lowlands from South American lineages.

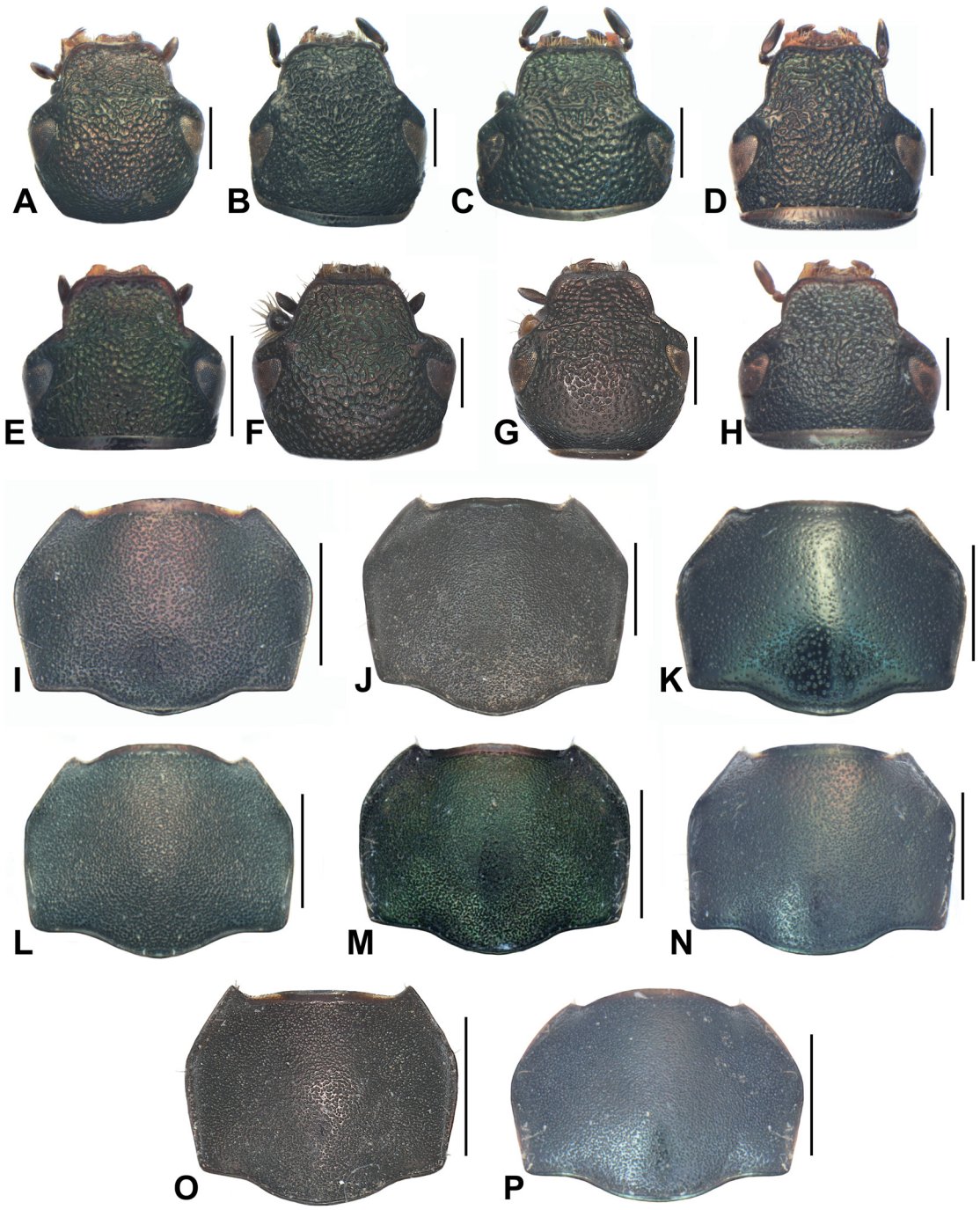

Fig. 2. Head and pronotum of the *Strigoderma* (*Costatergus*) spp. **A, I**. *S.* (*C.*) *costulipennis* Bates, 1888, ♂ (EMEC). **B, J**. *S.* (*C.*) *tenebrosa* Delgado & Mora-Aguilar, 2012, paratype, ♂ (IEXA). **C, K**. *S.* (*C.*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **D, L**. *S.* (*C.*) *juliani* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (UNSM). **E, M**. *S.* (*C.*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **F, N**. *S.* (*C.*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **G, O**. *S.* (*C.*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **H, P**. *S.* (*C.*) *borealis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (EMEC). Scale bars: A–H = 0.5 mm;. I–P = 1 mm.

Included species

Strigoderma (*Costatergus*) *costulipennis* Bates, 1888, *S.* (*Costatergus*) *tenebrosa* Delgado & Mora-Aguilar, 2012, *S.* (*Costatergus*) *paucipunctata* Andalco-Cid & Ramírez-Ponce sp. nov., *S.* (*Costatergus*) *juliani* Andalco-Cid & Ramírez-Ponce sp. nov., *S.* (*Costatergus*) *grossipenis* Andalco-Cid & Ramírez-

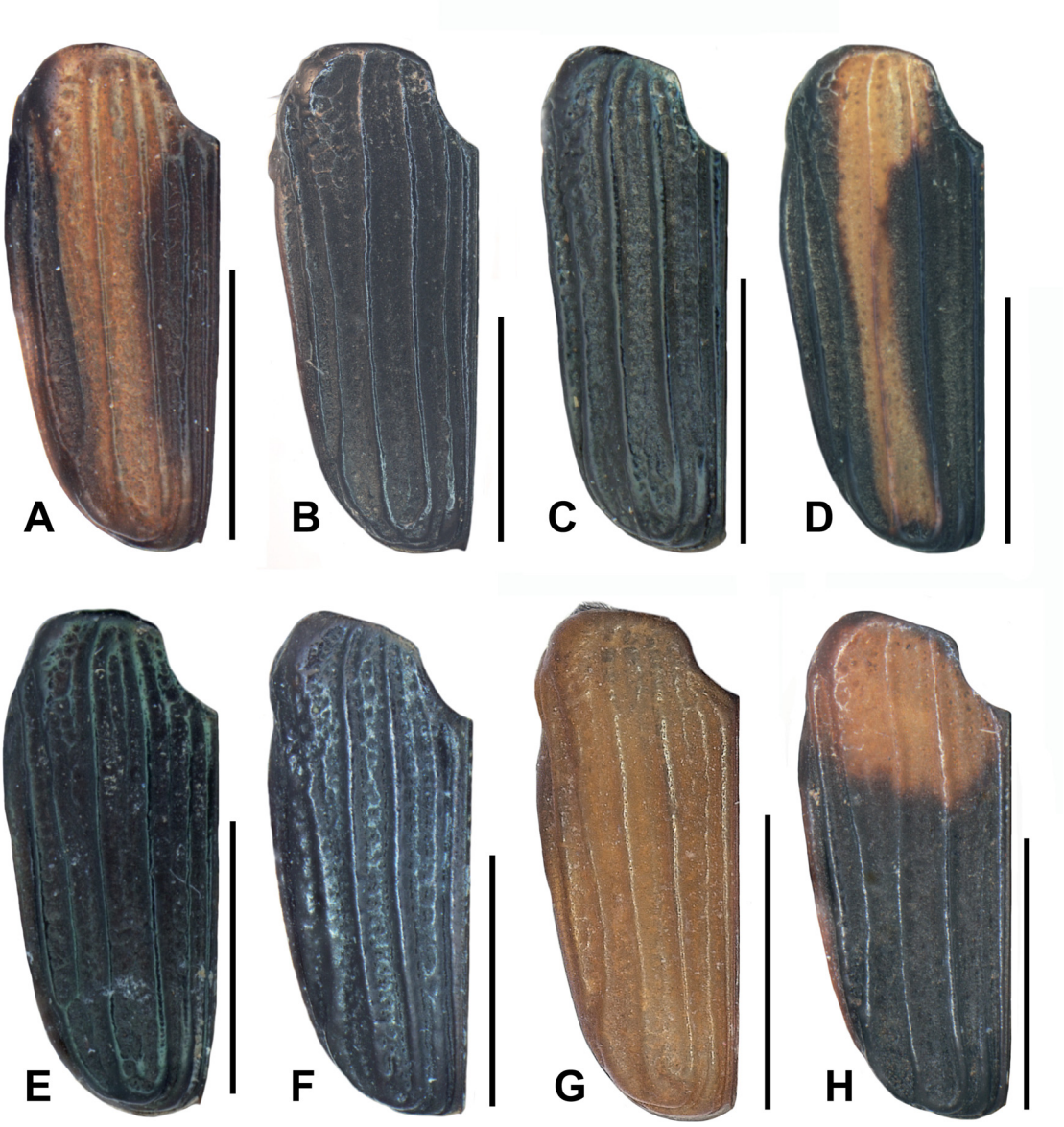

Fig. 3. Left elytra in dorsal view of the *Strigoderma* (*Costatergus*) spp. **A**. *S.* (*C.*) *costulipennis* Bates, 1888, ♂ (EMEC). **B**. *S.* (*C.*) *tenebrosa* Delgado & Mora-Aguilar, 2012, paratype, ♂ (IEXA). **C**. *S.* (*C.*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **D**. *S.* (*C.*) *juliani* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (UNSM). **E**. *S.* (*C.*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **F**. *S.* (*C.*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **G**. *S.* (*C.*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **H**. *S.* (*C.*) *borealis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (EMEC). Scale bars = 2 mm.

Ponce sp. nov., *S.* (*Costatergus*) *uniungula* Andalco-Cid & Ramírez-Ponce sp. nov., *S.* (*Costatergus*) *vulcanica* Andalco-Cid & Ramírez-Ponce sp. nov., and *S.* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce sp. nov.

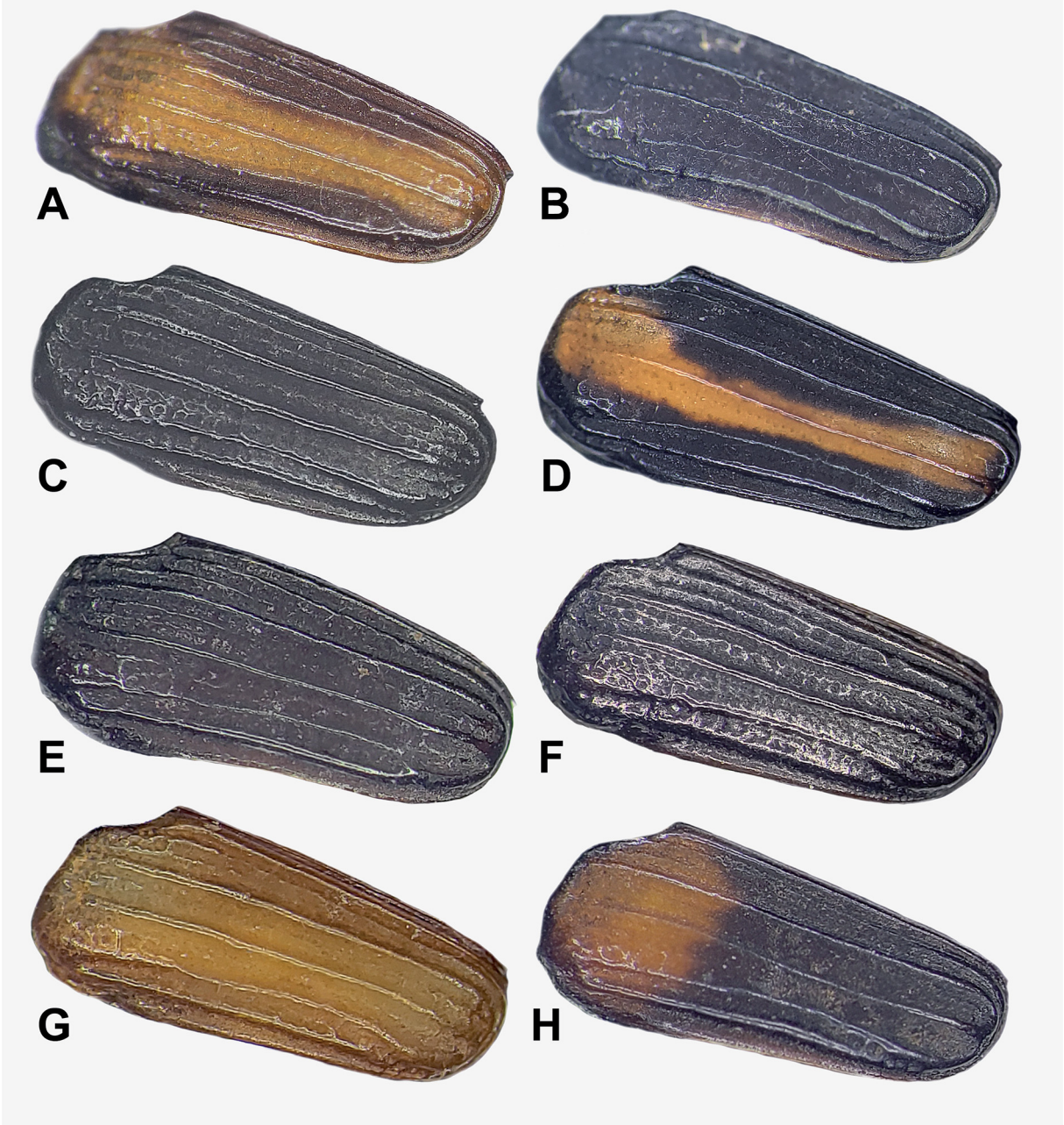

Fig. 4. Left elytra in antero-lateral view of the *Strigoderma* (*Costatergus*) spp. **A**. *S.* (*C.*) *costulipennis* Bates, 1888, ♂ (EMEC). **B**. *S.* (*C.*) *tenebrosa* Delgado & Mora-Aguilar, 2012, paratype, ♂ (IEXA). **C**. *S.* (*C.*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **D**. *S.* (*C.*) *juliani* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (UNSM). **E**. *S.* (*C.*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **F**. *S.* (*C.*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **G**. *S.* (*C.*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **H**. *S.* (*C.*) *borealis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (EMEC). Figures not to scale.

Comments

Bader (1992) considered *S. tomentosa* and *S. costulipennis* (Fig. 1A) within the same group "*Costulipennis*", justifying this by the granular surface of the elytra. However, the body shape, the unique condition of the elytra very different in both species (completely granular surface in *S. tomentosa vs* surface with notable ridges in *S. costulipennis*), and different genital configuration do not support this grouping, in addition to the fact that their geographic distributions present different biogeographic patterns. Additionally, Bader (1992) considered *S. costulipennis* as a species with a very wide and disjunct geographical distribution, with records that could not be corroborated.

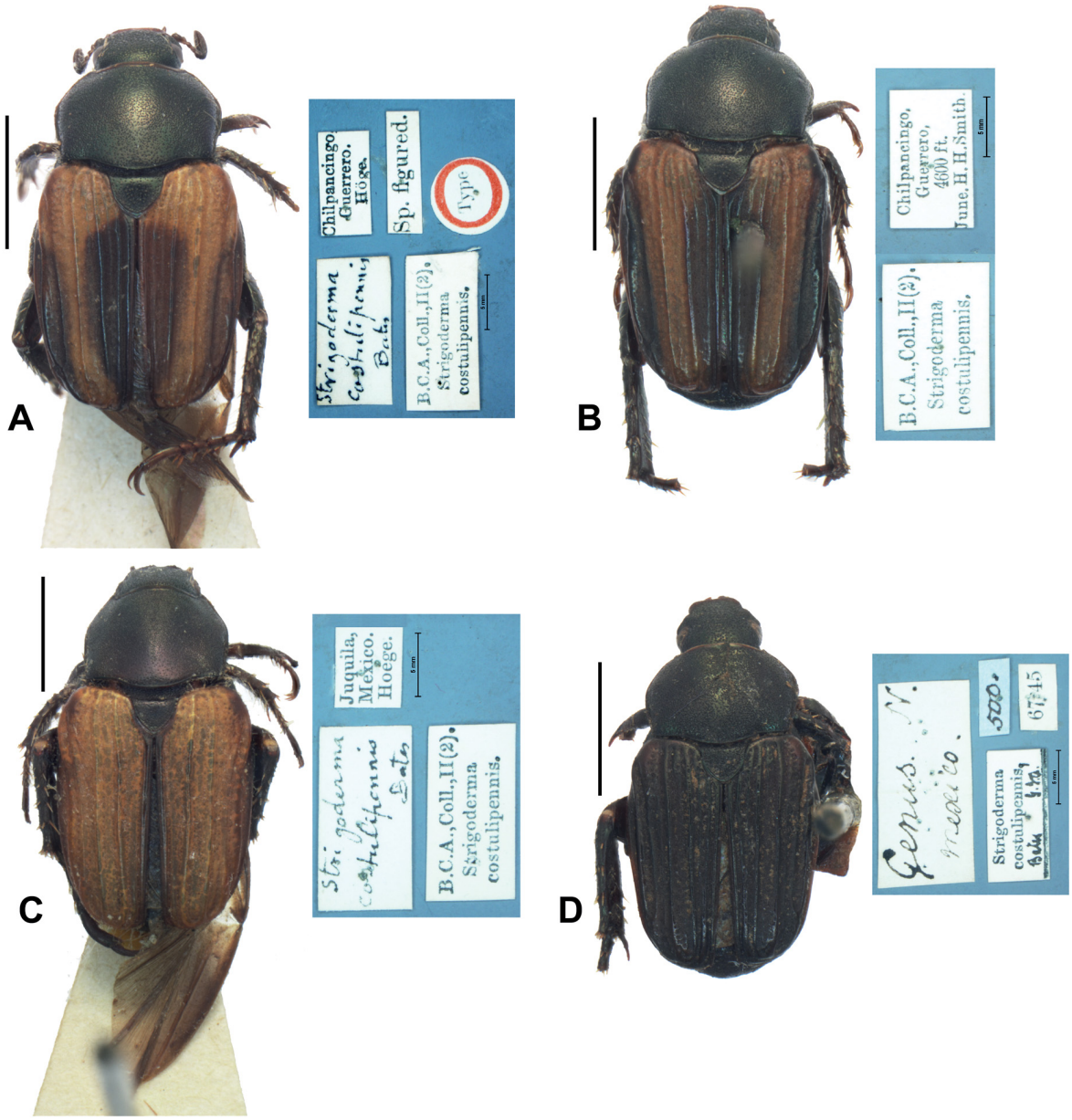

Fig. 5. Type series of *Strigoderma costulipennis* Bates, 1888. **A**. Lectotype, ♀ (here designated) (BMNH). **B**. Paralectotype, ♀ (here designated) (BMNH). **C**. *Strigoderma* (*Costatergus*) sp., ♀ (BMNH). **D**. *Strigoderma* (*Costatergus*) *grossipens* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., paratype, ♂ (BMNH). Scale bars = 2 mm.

Explanatory notes

Strigoderma tomentosa has traditionally been grouped together with *S. costulipennis*, since the former has shallow ridges, apart from this characteristic, they do not share much. *S. tomentosa* represents a particular taxon within the genus, so far recorded only from Juquila (Oaxaca, Mexico), and its morphology is unmistakable. It differs from *S. costulipennis* and from all the species in the subgenus *S.* (*Costatergus*) subgen. nov. (Fig. 1) by presenting as autapomorphy a 'coat' of short and soft hairs on the dorsal surface (frons and pronotum) (finely tomentose surface on elytra in *S.* (*Costatergus*)), it has a uniform green coloration (black coloration, sometimes with spots in *S.* (*Costatergus*)), in addition, the protarsal claw have both the upper and lower ramus long (claw with a very short lower ramus in *S.* (*Costatergus*)); the mesometasternal process is broadly rounded, but slightly protruding (narrow and protruding in *S.* (*Costatergus*)), and the parameres are elongated, thin towards the base, separated and with slightly concave tips (protruding in *S.* (*Costatergus*)).

Strigoderma* (*Costatergus*) *costulipennis Bates, 1888
Figs 1A, 2A, I, 3A, 4A, 5A–B, 6, 14

Strigoderma costulipennis Bates, l888: 260.

Strigoderma costulipennis – Nonfried 1893: 285 [monograph, revision]. — Ohaus 1928:124 [contributions]; 1987: 433 [catalogue]. — Blackwelder 1944: 246 [checklist]. — Machatschke 1957: 142 [fascicule, checklist]; 1972: 219 [catalogue]. — Arnett 1983: 90 [identification guide]. — Bader 1992: 302 [taxonomic revision].

Diagnosis

Elytra with nine elevated ridges; ridge 3, 5 and 7 only marked at base; ridge 8 and 9 convergent in distal third. 5th protarsomere with developed preapical denticle. Inner protarsal claw with rhomboidal lower ramus, slightly longer than half of upper ramus. Parameres elongated, thin, with curved outer margin.

Type material

Lectotype (here designated)
MEXICO – **Guerrero** • ♀; "Chilpancingo, Guerrero. Höge; // Sp. figured; // Type; // *Strigoderma costulipennis* Bates (handwritten); // B.C.A., Coll., II (2). *Strigoderma costulipennis*; // *Strigoderma* (*Costatergus*) *costulipennis* Bates LECTOTYPE ♀ Andalco-Cid & Ramírez-Ponce, des." [yellow label printed]; BMNH.

Paralectotypes
MEXICO – **Guerrero** • 1 ♀; "Chilpancingo, Guerrero, 4600 ft. June. H. H. Smith; // B.C.A., Coll., II (2). *Strigoderma costulipennis*; // *Strigoderma* (*Costatergus*) *costulipennis* Bates PARALECTOTYPE ♀ Andalco-Cid *et al*. 2024 des." [yellow label, printed]; BMNH. – **Oaxaca** • 1 ♀; "Juquila, México. Hoege. // B.C.A., Coll., II (2). *Strigoderma costulipennis*; // *Strigoderma costulipennis* Bates // *Strigoderma* (*Costatergus*) *costulipennis* Bates PARALECTOTYPE ♀ Andalco-Cid *et al*. 2024 des." [yellow label, printed]; BMNH"

Two specimens of the original type series housed at the BMNH belonging to the collection of the *Biologia Centrali-Americana* (Bates 1888: 260) are regarded here as representatives of different species; one female from "Juquila, México" of Höge (Fig. 5C) is only identified at this stage to subgenus level, and one male from "Mexico" (Fig. 5D) is now a paratype of *S.* (*C.*) *grossipenis* sp. nov.

Other material examined

MEXICO – **Guerrero** • 1 ♂; "Mexcala, Gro. Mex. VI-29-51; // P. D. Hurd Collector; // UC Berkeley EMEC 1324375 "QR Code"; // *Strigoderma costulipennis* Bates, Det. A. Bader 1989; // *Strigoderma costulipennis* Bates, Ramírez-Ponce & Andalco det."; EMEC • 1 ♂; "MEX: 2 Km S Xalitla, Gro. VII-25-83 J. Chemsak, A&M Michelbacher; // UC Berkeley EMEC 1324374 "QR Code"; // *Strigoderma costulipennis* Bates, Det. A. Bader 1989; // *Strigoderma costulipennis* Bates, Ramírez-Ponce & Andalco det."; EMEC.

Description

Male (UC Berkeley, EMEC 1324375)

Body size. Total length: 6.81 mm. Maximum elytral width: 2.88 mm (Figs 1A, 6A).

Body colour. Head, pronotum, and scutellum black with coppery reflections. Elytra ochre-yellow with wide dark coppery bands preceding the outer edge and contiguous to the suture. Abdomen dark reddish black (Fig. 6A–C).

Clypeus. Subrectangular, broad. Anterior angles broadly rounded; anterior edge slightly sinuate; outer margin moderately raised, interrupted in the centre. Surface with latero-apical excavation on each side. Punctation large, rough, deep and dense, with transverse pattern (Fig. 2A).

Frons. Convex. Rough-punctate sculpture, wider and deeper than in clypeus.

Antenna. Antennomeres 1–3 of similar length. Club as long as the pedicel and funiculus together (Fig. 6D).

Pronotum. Subtrapezoidal shape, clearly wider than long; noticeably widened on anterior half. Anterior angles short. Surface with longitudinal median groove reaching the middle. Punctures small, very dense, heterogeneous, almost rough (Fig. 2I). Lateral silhouette slight and uniformly convex (lateral view) (Fig. 6B).

Scutellum. Triangular shape, wide and angular apex. Sculpture with punctation similar in width and depth to the pronotum.

Elytra. Subparallel to the distal two thirds. Surface with nine elytral ridges with rounded edges; the 3rd, 5th, and 7th incomplete (only evident at the elytral base) (Figs 1A, 3A); ridges 8 and 9 join together as one on the distal third (Fig. 4A); intercostal space rough. Elytral suture elevated up to the 2nd distal third. Humeral callus discrete, developed up to the lateral margins of the elytra, interrupts the epipleura. Epipleura flat, thin and elevated (Fig. 6B).

Pygidium. Frontal shape wider than long, with a broadly rounded apex. Lateral shape noticeably convex in the median part. Surface uniform: sculpture with dense, deep punctures, smaller than propygidium and some overlapping. Vestiture with thin, long setae in the apical area.

Metasternum. Metasternal process narrow, slightly projecting; metasternal process uniform and deeply punctate (Fig. 6C).

Abdomen. Sternites 1, 2 and 3 almost equal in length. Sternite 4 as thick as the third sternite plus 1/4 of any of the first three. Surface with uniform punctation, separated by one puncture diameter (more dispersed on anal plate), sub-oval transverse, shallow (Fig. 6C).

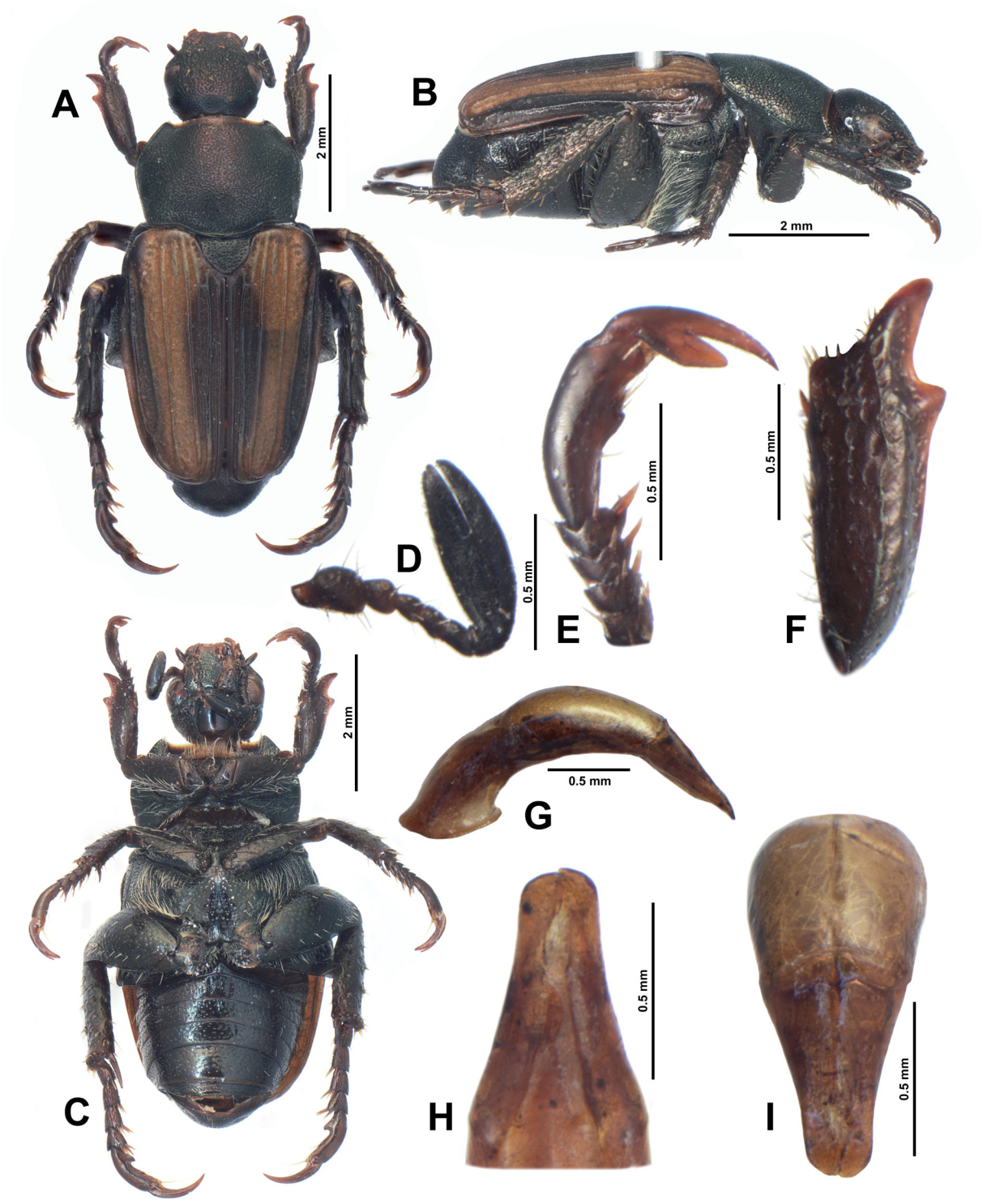

Fig. 6. *Strigoderma* (*Costatergus*) *costulipennis* Bates, 1888, ♂ (EMEC). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

Legs. Protibia thick; distal denticle long, slightly curved, with rounded apex (Fig. 6F). Protarsomeres 1–4 short and moderately broad, successively slightly shorter (Fig. 6E). Arrangement of ventral setae: 3 spines on each protarsomere, short to moderate, successively thicker. Protarsomere 5 robust, broad, slightly longer than combined length of protarsomeres 1–4. Ventral lobe inserted subapically, poorly developed. Inner protarsal claw broad and deeply notched: lower ramus rhomboidal, reaching slightly more than half of upper ramus (Fig. 6E). Mesotibia gradually thickened towards the apex; apex with 9–10 short spines. Surface with three transverse setiferous carinae; the proximal one with 3–4 thick and moderately long spines; the middle one with 4–5 thick and long spines; the distal one with 5–6 long spines. Surface with moderately deep and regular to irregular punctation. Apical spurs straight: the inner one with rounded apex, as long as the first two tarsomeres plus part of the third; the outer one with rounded apex, of similar length to the first one plus almost the second mesotarsomere. Mesotarsomeres 1–4 of similar length and thickness. Dorsal setae pattern: first tarsomere with 2 long, thick spines; second and third with 2 moderately thick, moderately long setae; fourth with two long, thin setae. Ventral setae pattern: first and second tarsomere with three long spines and one seta; third and fourth with four long, thick spines. Metatibia clearly widened in the middle and apical part; apex with 12–13 short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 thick spines; the middle one with 6–7 moderate spines, the distal one with 8–9 long spines. Apical spurs straight: the inner one very thick with rounded apex, as long as the first tarsomere; the outer one with rounded apex, of a length similar to half of the first mesotarsomere. Metatarsomeres similar in length, thickening upwards. Dorsal setae pattern: tarsomere 1 with 2 moderately long and moderately thin spines; protarsomere 2 and 3 with 2 spines successively thinner; fourth not noticeable. Ventral setae pattern: protarsomere 1 with 4 long and thick spines; protarsomeres 2, 3 and 4 with 3 long and successively thinner spines and 1 long seta successively thinner.

Genitalia. Parameres long, with curved outer margin, narrower before the apex; rounded apices (Fig. 6H–I). Apical figure (lateral view) slightly curved ventrally (Fig. 6G).

Variation. Males may have a coppery or greenish reflection on pronotum and head.

Female

Similar to the male, except for the following differences. Head with punctation slightly more superficial and slightly less dense on clypeus and frons; antennal club shorter. Pronotum with slightly smaller punctation, noticeably less dense on the posterior central area. Elytra with very thickened outer ridge, clearly sinuate in its middle portion. Pygidium subtly concave (in lateral view).

Distribution

This species is distributed in the centre of the state of Guerrero (southern Mexico), in localities located between 500 and 1400 m a.s.l., characterized by scrubland and low deciduous forest (Fig. 14).

Natural history

It has been collected on flowers of *Acacia* Mill. Its life cycle is unknown. Adult specimens were collected in June and July.

Taxonomic comments

The type specimens housed at the BMHN (three females and one male; Fig. 5), represented a mixture of three different species, which, upon review and comparison with the other species, were able to be associated based on morphology and biogeographical correspondence.

In the case of the specimen cited from Juquila (Fig. 5C) (one single female), it is an unpublished species different from those described here, while the male specimen cited as "Mexico" (Fig. 5D) corresponds to *Strigoderma* (*C.*) *grossipenis* sp. nov.

We reject the record from Etla for this species cited by Machatschke (1957, 1972), because the species of the subgenus have restricted distributions, as demonstrated in the specific definitions present.

Strigoderma* (*Costatergus*) *tenebrosa Delgado & Mora-Aguilar, 2012
Figs 1B, 2B, J, 3B, 4B, 7, 14

Strigoderma tenebrosa Delgado & Mora Aguilar, 2012: 46 [original combination].

Diagnosis

Pronotum dense and finely punctate, with projecting anterior angles. Elytra with seven ridges; the sixth and seventh not converging to form a single ridge in the distal third. Third ridge only developed at the base of the elytra. Internal protarsal claw with inferior ramus less than half the length of the upper ramus. Parameres elongate, subtriangular, with almost straight external margins.

Etymology

From the Latin '*tenebrōsus*, *tenebra*' ('darkness'), alluding to its intense dark colour.

Type material

Holotype (revised)
MEXICO – **Chiapas** • ♂; "MEXICO: Chiapas, Villaflores, Finca Santa Elena, 12-VI-2001, C.J. Morales col."; IEXA.

Paratype (revised)
MEXICO – **Chiapas** • ♂; same data as for holotype; EMAC.

Other material examined

MEXICO – **Chiapas** • 2 ♂♂; "Villa Flores, Chiapas, México, 10-06-1984, Aguilar. A // *Strigoderma tenebrosa* Delgado & Mora-Aguilar, 2012. Ramírez Ponce, 2021 det."; ARPC.

Redescription

Holotype male (IEXA)
Body size. Total length: 7.7 mm. Maximum elytral width: 4.1 mm (Fig. 1B).

Body colour. Completely black, with greenish reflections mainly on the protarsus (Fig. 7A–C).

Clypeus. Sub-trapezoidal, elongate. Anterior angles rounded; anterior edge slightly sinuate; external margin weakly raised. Surface with latero-basal excavation above the fronto-clypeal suture. Surface with broad, rough, deep and dense punctation (Fig. 2B).

Frons. Convex. Sculpture roughly-punctate, very dense, wider and deeper than in clypeus on disc (Fig. 2B).

Antenna. Antennomere 3 longer than the preceding ones. Club longer than the pedicel and funiculus together (Fig. 7D).

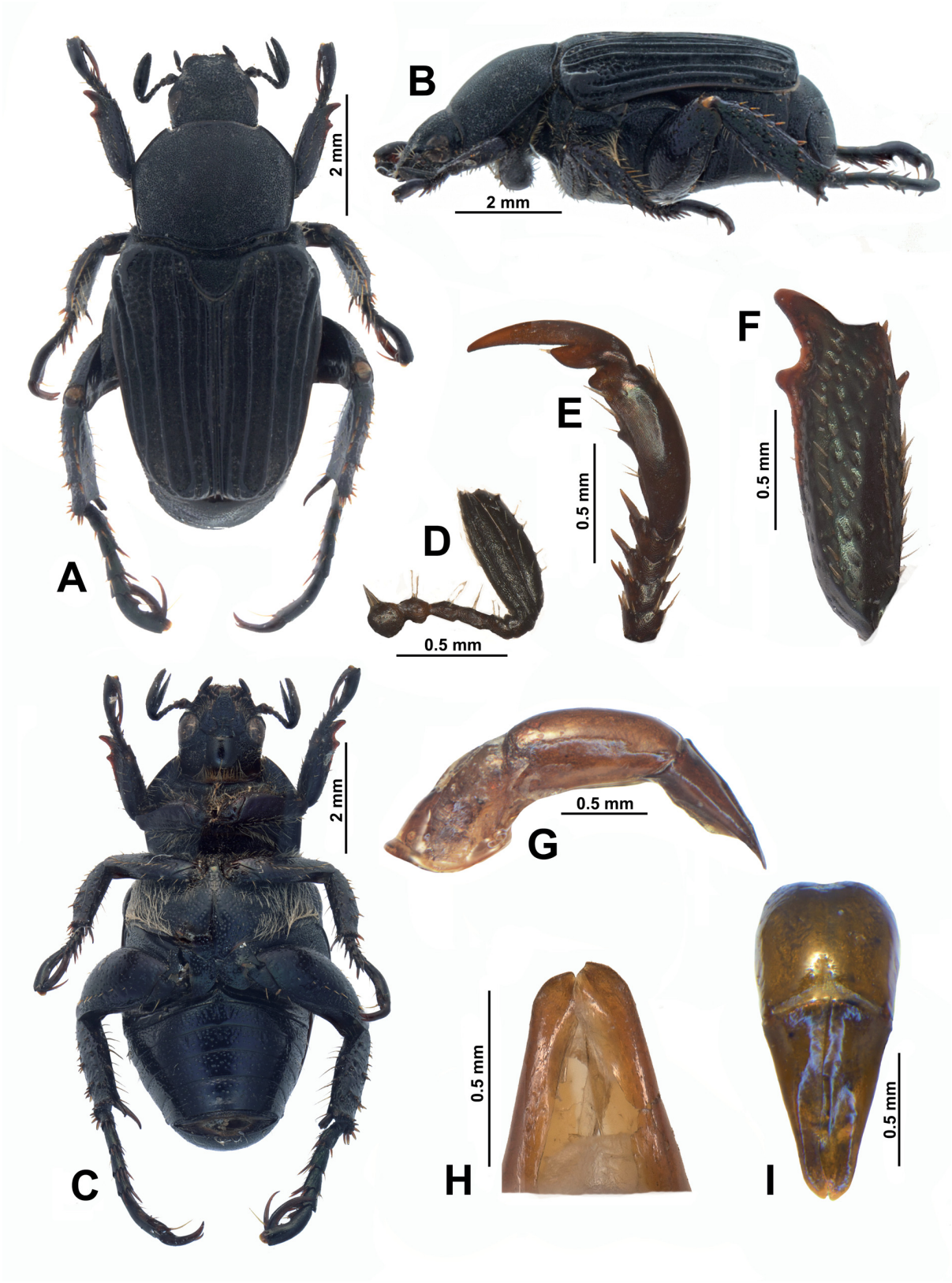

Fig. 7. *Strigoderma* (*Costatergus*) *tenebrosa* Delgado & Mora-Aguilar, 2012, paratype, ♂ (IEXA). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. H. Ventral view. **I**. Frontal view.

Pronotum. Subrectangular, longer than wide; moderately widened in anterior half. Anterior angles projecting. Surface without longitudinal median groove. Punctation small, very dense, homogeneous, fine (Fig. 2J). Lateral view moderately convex (Fig. 7B).

Scutellum. Broad sub-triangular, with rounded apex. Surface punctation similar in width to pronotum, deeper.

Elytra. Subparallel to the 2nd third. Surface with seven elevated ridges with acute edges; the 3rd, incomplete (only evident at the elytral base) (Fig. 3B); ridges six and seven not joint together as one on the distal third (Fig. 4B); intercostal space wide, shallow and smooth. Elytral suture elevated up to the 2nd distal third. Humeral callus discrete, developed up to the lateral margins of the elytra, interrupts the epipleura. Epipleura flat, thin and elevated.

Pygidium. Wider than long, with a broadly rounded apex. Punctation small, deep, dense and well-defined.

Metasternum. Metaventral process slightly broad and slightly projecting; metasternum uniform and somewhat finely punctate (Fig. 7C).

Abdomen. Sternites 1, 2 and 3 almost equal in length. Sternite fourth as thick as the third sternites plus ½ of any of the first two (Fig. 7C). Surface with uniform punctation, separated by two puncture diameters (more dispersed on anal plate), almost rounded, shallow.

Legs. Protibia thick; distal denticle long, slightly curved, with rounded apex (Fig. 7F). Protarsomeres 1–4 conspicuously short and broad, successively slightly longer (Fig. 7E). Ventral setae with three short to moderately long spines, very thick to moderately thin, successively decreasing in thickness. 5th protarsomere robust, broad, slightly longer than tarsomeres 1–4 together. Ventral lobe subapical, developed. Inner protarsal claw broad and deeply notched: lower ramus lanceolate, not reaching half the length of the upper one (Fig. 7E). Mesotibia thickened in the middle; apex with 12–13 short spines. Surface with two transverse setiferous carinae; the upper one with 4 to 5 thick and medium spines; the lower one with 12–13 medium spines. Surface with very large, irregular and superficial puncture-like impressions. Apical spurs straight: the inner one with a rounded apex, as long as the first two tarsomeres; the outer one with a rounded apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 of similar in length and thickness. Dorsal setae pattern: mesotarsomeres 1–3 with 2 long, moderately thin spines; mesotarsomere 4 with 2 long, thin setae. Ventral setae pattern: mesotarsomeres 1–3 with 4 short to long, thick spines; mesotarsomere 4 with 3 short to long spines and 1 moderately thick, long seta. Metatibia clearly widened in the middle and apex; apex with 11–12 short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 thick spines; the middle one with 5–6 moderate spines, the distal one with 8–9 long spines. Apical spurs straight: the inner one with rounded apex, as long as the first one plus a small part of the second tarsomere; the outer one with sharp apex, of similar length to the first mesotarsomere. Metatarsomeres thickened and elongated in descending order. Dorsal setae pattern: metatarsomere 1 with 2 thick spines; metatarsomeres 2 and 3 with 2 long, moderately thick spines; metatarsomere 4 with 2 long, thin setae. Ventral setae pattern: metatarsomeres 1 and 2 with 4 long, thick spines; metatarsomere 3 with 3 long, thick spines and 1 long, thin setae; metatarsomere 4 with 2 long, moderately thick spines and 2 long setae.

Genitalia. Parameres long, subtriangular, with outer margin almost straight, gradually narrowing; apices slightly acute (Fig. 7H–I). Figure (lateral view) slightly curved ventrally (Fig. 7G).

Variation. Males may have more intense greenish reflections on the head and pronotum. The surface between the ridges may vary from longitudinally concave to slightly convex.

Female

Unknown.

Distribution

This species has only been recorded from the central depression of Chiapas (Fig. 14).

Natural history

Collected from corn plants and tropical deciduous forest areas at 600 m a.s.l. (Delgado & Mora-Aguilar 2012).

Taxonomic comments

This species presents the greatest similarity with *S.* (*C.*) *juliani* sp. nov. and *S.* (*C.*) *borealis* sp. nov., characterized by the absence of three ridges (in relation to the species that all have nine or 10), making the spaces between the ridge very wide and lacking punctation. However, *S.* (*C.*) *tenebrosa* is distinguished by the presence of the complete 2nd ridge (blurred in the central part of the elytra in *S.* (*C.*) *juliani*), and the lower ramus shorter than half the length of the upper one (longer than half the length of the upper one in *S.* (*C.*) *borealis*).

Strigoderma* (*Costatergus*) *paucipunctata Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
urn:lsid:zoobank.org:act:47F19470-2C21-4864-A41B-DB48FBD8AB4B
Figs 1C, 2C, K, 3C, 4C, 8, 14

Diagnosis

Pronotum with heterogeneous (small to moderate) and sparse punctation (punctures not touching) over the entire surface. Elytra with 5 complete, rounded elevated ridges; interestrial area with wide, very shallow punctation; 5th and 6th subparallel ridges throughout. 5th protarsomere with barely apparent basal denticle. Parameres with almost straight lateral margins.

Etymology

From the Latin '*pauci*' ('few'), and the Latin '*punctum*' ('prick, sharp point'), in reference to the scattered punctation of the pronotum; '*paucipunctata*', 'with few punctures'.

Type material

Holotype

MEXICO – **Chiapas** • ♂; "Sepuleura [Sepultura] Canyon, Chiapas, México VI-27-87; // 16 Km north, Arriaga, Chiapas, Mexico VI-27-87; // Coll. by W. F. Chamberlain; // TAMU ENTO X0043337 "barcode"; // *Strigoderma costulipennis* Bates, Det. 1997 by Paul K. Lago; // *Strigoderma* (*Costatergus*) *paucipunctata* Andalco-Cid & Ramírez-Ponce, 2025 HOLOTYPE" [red label, printed]; TAMU.

Description

Body size. Total length: 6.77 mm. Maximum elytral width: 2.89 mm (Fig. 1C).

Body colour. Completely black with intense greenish reflections, except elytra without reflections (Fig. 8A–C).

Clypeus. Subrectangular, elongate. Anterior angles broadly rounded; anterior edge slightly sinuate; outer margin weakly raised. Surface with an anterolateral excavation on each side. Punctation broad, rough, deep and dense (Fig. 2C).

Frons. Flat. Rough-punctate sculpture, denser than on clypeus (Fig. 2C).

Antenna. Antennomere 3 longer than preceding ones. Club as long as pedicel and funiculus together (Fig. 8D).

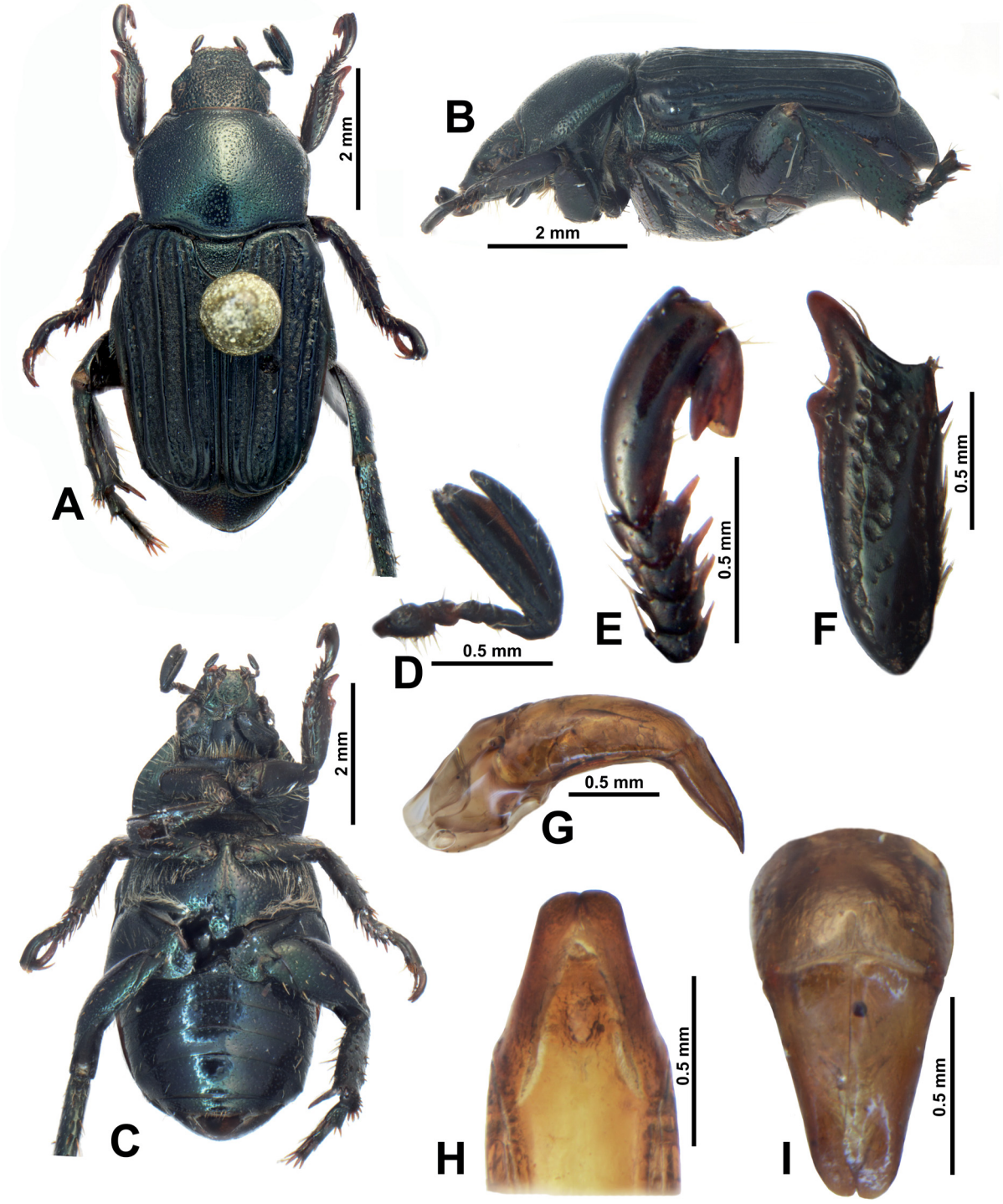

Fig. 8. *Strigoderma* (*Costatergus*) *paucipunctata* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

Pronotum. Subtrapezoidal, distinctly broader than long; widened in anterior half. Anterior angles short. Surface without longitudinal median groove. Mixed punctation; small to moderate, dense in small areas, mainly on sides (Fig. 2K). Lateral view markedly convex (side view) (Fig. 8B).

Scutellum. Triangular in shape, wide, with rounded apex. Sculpture with abundant punctation, very small, defined, thick and deep.

Elytra. Subparallel to the 2nd third. Surface with six elevated ridges with rounded edges (Fig. 3C); ridges five and six not joining together to form only one in the distal third (Fig. 4C); intercostal space slightly rough and punctate, with shallow and very wide punctures. Elytral suture elevated up to the 2nd distal third. Humeral callus prominent, developed to the lateral margins of the elytra, interrupting the epipleura. Epipleura thick at the base, with a noticeable fold above the episternum, the rest flat and elevated.

Pygidium. Wider than long, with a broadly rounded apex. Shape (in lateral view) noticeably convex in the middle part. Surface regular and uniform, with lateral depressions in the anterior portion. Surface punctation moderate in size, deep and dense.

Metasternum. Metaventral process narrow, not projecting; metasternum uniform and moderately punctate, punctation somewhat small and scattered (Fig. 8C).

Abdomen. Sternites 1, 2 and 3 almost equal in length. Sternite 4th as thick as any of the first three sternites plus the half of another. Surface with small uniform punctation, separated by three puncture diameters (more dispersed on anal plate), sub-oval transverse, shallow (Fig. 8C).

Legs. Protibia thick; distal denticle long, slightly curved, with rounded apex (Fig. 8F). Protarsomeres 1–4 conspicuously short and broad, of similar size and thickness (Fig. 8E). Ventral setae on tarsomere 1 and 2 with three spines, very short to long, moderately thin; third and fourth protarsomeres with three thick spines, very short to long. Protarsomere 5 robust, broad, slightly longer than tarsomeres 1–4 together. Ventral lobe poorly developed, medially-internally positioned, widely rounded (Fig. 8E). Mesotibia gradually thickened towards the apex; apex with 9–10 medium spines. Surface with two transverse setiferous carinae; the upper one with 5–6 thick and moderately long spines; the lower one with 7–8 long spines. Sculpture with very deep and irregular punctation. Apical spurs straight, the inner one with acute apex, as long as the first two tarsomeres; the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 of similar length and thickness. Dorsal setae pattern: first mesotarsomere with 2 thick, moderately long spines; second and third mesotarsomeres with 2 moderately long, moderately thick spines; fourth mesotarsomere with 2 thin setae. Ventral setae pattern: first, second, and third mesotarsomeres with 4 thick, moderately long spines; fourth mesotarsomere with 4 moderately long, moderately thin spines. Metatibia clearly widened in the middle and apical part; apex with 11–12 medium spines. Surface with two transverse setiferous carinae: the proximal one with 4–5 thick spines; the distal one with 7–8 long spines. Sculpture with very deep and irregular punctation. Apical spurs straight: the inner one with a rounded apex, as long as the first two tarsomeres; the outer one short, very thick with a rounded apex, slightly shorter than the first mesotarsomere. Metatarsomeres dorsal setae pattern: fourth metatarsomere with 2 moderately long and stout spines; third metatarsomere with two moderately long and slender setae; second metatarsomere with 2 long and slender setae. Ventral setae pattern: first metatarsomere with 4 long and stout spines; second metatarsomere with 3 long and stout spines and one setae; third metatarsomere with 2 spines and two setae.

Genitalia. Parameres short, subtriangular, with outer margin almost straight, gradually narrowing; apices rounded (Fig. 8H–I). Apical figure (lateral view) slightly curved ventrally (Fig. 8G).

Female

Unknown.

Distribution

This species has only been recorded from the type locality (16 km north of Arriaga, Chiapas), close to the La Sepultura Biosphere Reserve and within the "Selva Zoque-La Sepultura" Terrestrial Priority Region for Conservation (RTP-132) (Arriaga *et al*. 2000), characterized by an intermixture of extensive forest masses of tropical forests, mesophilous forests and pine forests, high rates of endemism and a Pleistocene refuge for diverse groups (Fig. 14).

Natural history

Feeding habits and life cycle are unknown. The only specimen was collected in June.

Taxonomic comments

This species is easy to distinguish as it has the widest, most heterogeneous and least dense pronotal punctation (Figs 2K, 8A). It shares with *S*. (*C*.) *grossipenis* sp. nov. and *S*. (*C*.) *uniungula* sp. nov. the intercostal area with wide punctation; however, *S*. (*C*.) *grossipenis* has convergent ridges 5 and 6 in the apical callus (subparallel in *S*. (*C*.) *paucipunctata* sp. nov.), and in *S*. (*C*.) *uniungula* the intercostal punctation is very marked (shallow in *S*. (*C*.) *paucipunctata*), in addition to being the only species with a simple inner protarsal claw (split in *S*. (*C*.) *paucipunctata*).

Strigoderma* (*Costatergus*) *juliani Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
urn:lsid:zoobank.org:act:ED68ADF7-C51A-46E9-AFB2-3AD25A273C5F
Figs 1D, 2D, L, 3D, 4D, 9, 14

Diagnosis

Pronotum with uniform, very dense and fine punctation. Elytra with 5 complete, sharp elevated ridges, the 2nd only marked at the ends; inter-costal area without punctation; ridges 5 and 6 subparallel throughout. Protarsomere 5th with basal denticle very poorly developed. Parameres with slightly curved lateral margins.

Etymology

We dedicate this species to the memory of our colleague and entomologist Julián Hernández Cruz, who worked with the scarab beetle fauna of Oaxaca, mainly in the Sierra Sur where this species comes from.

Type material

Holotype

MEXICO – **Oaxaca** • ♂; "MEXICO: Oaxaca 12 Km W. El Camarón 22 June 1974 W. E. Steiner; // *Strigoderma* (*Costatergus*) *juliani* Andalco-Cid & Ramírez-Ponce, 2025 HOLOTYPE" [red label, printed]; UNSM.

Paratype

MEXICO – **Oaxaca** • 1 ♀; "Oax. nr Totolapan Aug.5, 1965 Flint & Ortíz // *STRIGODERMA COSTULIPENNIS* BATES, Det. M. E. Jameson 1997; // *Strigoderma* (*Costatergus*) *juliani* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE" [yellow label, printed]; UNSM.

Description

Body size. Total length: 7.50 mm. Maximum elytral width: 3.23 mm (Fig. 1D).

Body colour. Head, pronotum, scutellum and legs shiny black, with greenish reflections on clypeus and legs. Elytra ochre-yellow, with wide black bands longitudinally covering the outer third and a wide area adjacent to the suture (Fig. 9A–B). Abdomen dark reddish black (Fig. 9C).

Clypeus. Sub-quadrangular, elongate. Anterior angles rounded; anterior edge broadly sinuate; outer margin weakly raised. Surface punctation broad, rough, deep and dense; points joined forming irregular transverse groove patterns (Fig. 2D).

Frons. Sculpture rough-punctate, dense; defined points slightly smaller than on clypeus (Fig. 2D).

Antenna. Antennomere 3 longer than the preceding ones. Club slightly shorter than the pedicel and funiculus together (Fig. 9D).

Pronotum. Subrectangular, longer than wide; moderately widened in anterior half. Anterior angles projected. Surface without longitudinal median groove. Punctation small, very dense, homogeneous, fine (Fig. 2D). Lateral figure markedly convex (lateral view) (Fig. 9B). Scutellum triangular, wide, with rounded apex. Sculpture with punctation very small, defined, thick, deep and dense.

Elytra. Subparallel to the 2nd third. Surface with six elevated ridges with sharp edges; the 2nd incomplete (diffuse in the middle portion) (Fig. 3D); ridges five and six not converging to form one in its distal third (Fig. 4D); intercostal space wide and uniform. Elytral suture elevated up to the 2nd distal third. Humeral callus prominent, developed to the lateral margins of the elytra, interrupting the epipleura. Epipleura thick at the base, with a noticeable fold above the episternum, remainder of the structure flat and elevated.

Pygidium. Wider than long, with broadly rounded apex. Shape (in lateral view) noticeably convex in the middle part. Surface regular and uniform, with lateral depressions on the anterior portion. Sculpture with abundant, small, thick and deep punctation.

Metasternum. Mesometasternal process somewhat broad, slightly projected; metasternum uniform and deeply punctate (Fig. 9C).

Abdomen. Sternites 1, 2 and 3 are almost the same size. Sternite 4th as thick as any of the first three sternites plus one half as much as another. Surface with uniform punctation, separated by two puncture diameters (more dispersed on anal plate), almost rounded, bit deep (Fig. 9C).

Legs. Protibia thick; distal denticle long, slightly curved, with rounded apex (Fig. 9F). Protarsomeres 1–4 conspicuously short and broad, of similar size and thickness (Fig. 9E). Arrangement of ventral setae: protarsomere 1st and 2nd with three very short to long, moderately thin to thin spines; protarsomere 3rd and 4th with three thick and very short to long spines. Protarsomere 5 slender, slightly longer than tarsomeres 1–4 together. The ventral lobe poorly developed, in medial-internal position (Fig. 9E). Mesotibia **g**radually thickened towards the apex; apex with 9–10 medium spines. Surface with two transverse setiferous carinae; the upper one with 5–6 thick and moderately long spines; the lower one with 7–8 long spines. Sculpture with very deep and irregular punctation. Apical spurs straight: the inner one with acute apex, as long as the first two tarsomeres; the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 of similar length and thickness. Dorsal setae pattern: first mesotarsomere with 2 thick, moderately long spines; second and third mesotarsomere with 2 moderately long, moderately thick spines; fourth mesotarsomere with 2 thin setae. Ventral setae pattern: first, second, and third mesotarsomere with 4 thick, moderately long spines; fourth mesotarsomere with 4 moderately long, moderately thin spines. Metatibia clearly widened in the middle and apical part; apex with 11–12 medium spines. Surface with two transverse setiferous carinae: the proximal one with 4–5 thick spines; the distal one with 7–8 long spines. Sculpture with very deep and irregular punctation. Apical spurs

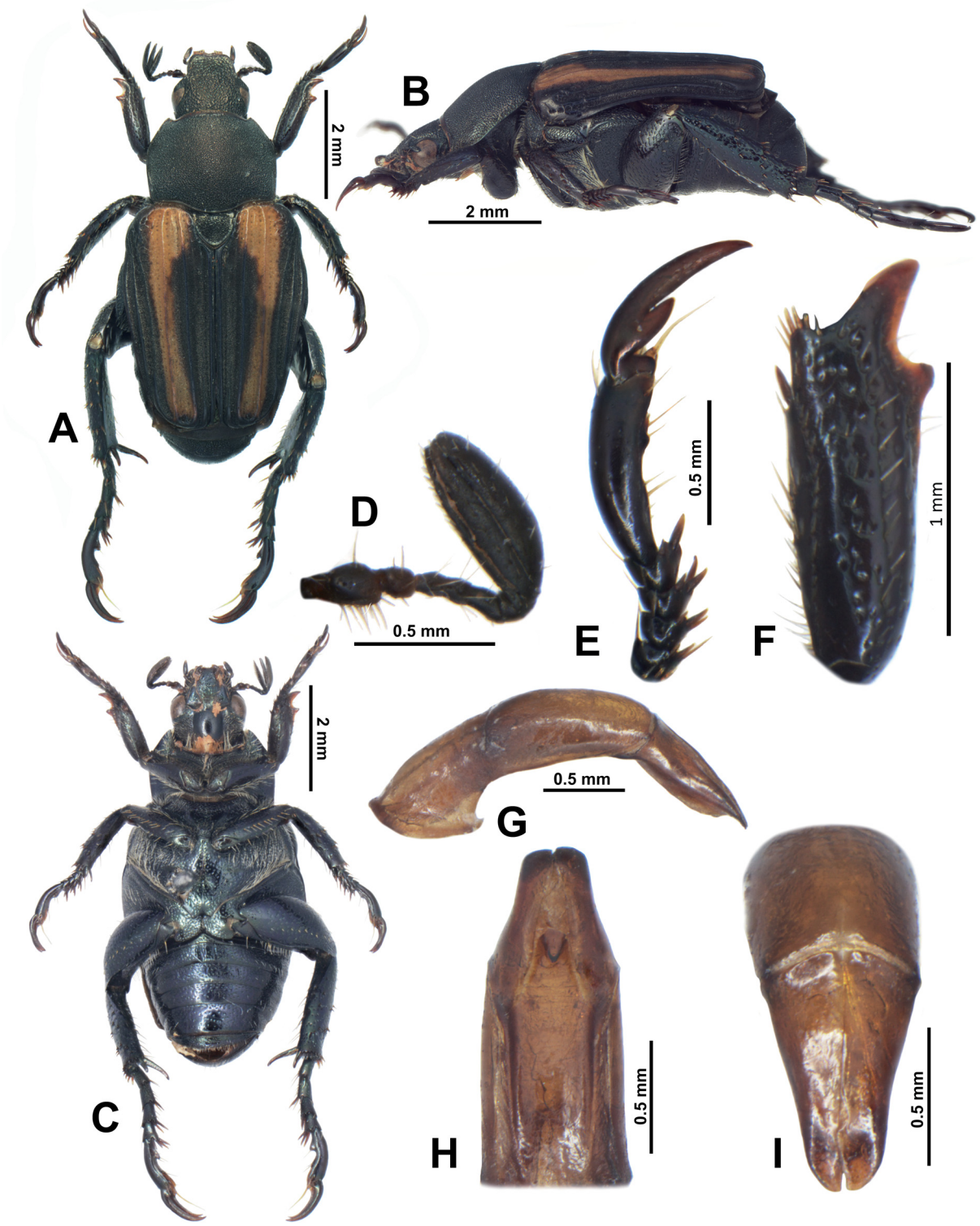

Fig. 9. *Strigoderma* (*Costatergus*) *juliani* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (UNSM). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

straight: the inner one with a rounded apex, as long as the first two tarsomeres; the outer one short, very thick with a rounded apex, slightly shorter than the first mesotarsomere. Metatarsomeres dorsal setae pattern: fourth metatarsomere with 2 moderately long and thick spines; third metatarsomere with two moderately thin long setae; second metatarsomere with 2 long and thin setae. Ventral setae pattern: first metatarsomere with 4 long and thick spines; second metatarsomere with 3 long and thick spines and one seta; third metatarsomere with 2 spines and two setae.

Genitalia. Parameters long, with curved outer margins, narrower before the apex; rounded apices (Fig. 9H–I). Apical figure (lateral view) slightly curved ventrally (Fig. 9G).

Female

Similar to holotype except by: pronotum with denser and finer punctation; elytra entirely deep orange, base of fifth ridge extremely thickened; mesometasternal space considerably broader and metasternum longer; abdomen extremely inflated; protibia with longer and curved distal denticle; protarsomeres 1–4 thinner and inner protarsal claw like both rami similar in thickness and length.

Distribution

This species has been recorded in the Sierra Sur of the Oaxaca State, between 700 and 930 m a.s.l. (El Camarón and Totolapan). This is an area belonging to the Terrestrial Priority Region for Conservation "Sierra Sur and Coast of Oaxaca" (RTP-129), characterized mainly by coniferous forests and medium altitude rainforest (Arriaga *et al*. 2000) (Fig. 14).

Natural history

The feeding habits and life cycle of this species are unknown. The specimens were collected in June and August.

Taxonomic comments

This species is easy to distinguish as it is the only one with the 2nd elytral ridges only marked at its ends, since the most closely related species, *S*. (*C*.) *borealis* sp. nov. (from Nayarit), has the 2nd ridge complete along its entire length, although very thin. Other distinguishing characteristics are: internal protarsal claw with lower ramus less than half the length of the upper ramus (half the length in *S*. (*C*.) *borealis*), pronotum with broader punctation (denser and smaller in *S*. (*C*.) *borealis*), elytra with the yellowish area covering the entire length of the elytra (only the first anterior third in *S*. (*C*.) *borealis*), and long and thin parameres (short and wide in *S*. (*C*.) *borealis*).

Strigoderma* (*Costatergus*) *grossipenis Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
urn:lsid:zoobank.org:act:23C176C5-52F5-4EF4-B71E-D49F99C9EB3A
Figs 1E, 2E, M, 3E, 4E, 5D, 10, 14

Diagnosis

Antennal club longer than scape, pedicel and funiculus together. Elytra with 10 elevated ridges; ridges 3, 5, 6 and 8 only marked at elytral base; complete ridges 5th and 6th (last external) convergent in distal third. 5th protarsomere with developed internal preapical denticle. Internal protarsal claw with rhomboidal lower ramus, slightly longer than half the length of the upper ramus. Short parameres, with slightly curved lateral margins and widely rounded apex.

Etymology

From late Latin '*grossus*' ('thick'), and Latin '*penis*' ('tail, penis'), alluding to the notable thickness of the parameres in this species.

Type material

Holotype

MEXICO – **Guerrero** • ♂; "México, Guerrero, Techan de Galeana, Piedra de Tlacoyunque km. 50 Acapulco - Zihuatanejo 17º15'34''N, 100º59'55''O, 006 msnm 19-XI-2006, G. Ortega, L. Cervantes, C.; // 45234 "QR code"; // IBUNAM: CNIN: CO45234 "BAR CODE"; // Colección del Instituto de Biología, UNAM. México, D. F.; // *Strigoderma* (*Costatergus*) *grossipenis* Andalco-Cid & Ramírez-Ponce, 2025 HOLOTYPE" [red label, printed]; CNIN.

Paratype

MEXICO – 1 ♂; "Genus N. Mexico; // *Strigoderma costulipennis* Bates [illegible]; // 500; // 6745; // *Strigoderma* (*Costatergus*) *grossipenis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE" [yellow label, printed]; BMNH.

Description

Body size. Total length: 6.5 mm. Maximum elytral width: 2.96 mm (Fig. 1E).

Body colour. Head and legs shiny coppery black; frons and clypeus with greenish reflections; rest of body completely black with greenish reflections (Fig. 10A–C).

Clypeus. Subrectangular, broad. Anterior angles broadly rounded; anterior edge almost straight; external margin well elevated. Surface with a latero-apical excavation on each side. Punctation large, rough, deep and dense (Fig. 2E).

Frons. Convex. Sculpture roughly-punctate, similar to that of the clypeus (Fig. 2E).

Antenna. Pedicel slightly longer than the 1st and 2nd flagellomere. Club as long as the scape, pedicel and funiculus together. Pedicel slightly longer than the 1st and 2nd flagellomere (Fig. 10D).

Pronotum. Subtrapezoidal, clearly broader than long; noticeably widened in anterior half. Short anterior angles. Surface without longitudinal median groove. Punctation small, very dense, homogeneous and fine (Fig. 2M). Lateral figure markedly convex (in lateral view) (Fig. 10B).

Scutellum. Rounded, with thickened edge. Sculpture with punctation slightly less wide, denser and deeper than that of the pronotum.

Elytra. Subparallel to the 2nd third. Surface with 10 elevated ridges with rounded edges; the 3rd, 5th, 6th and 8th incomplete (only evident at the elytral base) (Fig. 3E); ridges nine and ten join together as one on the distal third (Fig. 4E); intercostal space slightly rough. Elytral suture elevated up to the 2nd distal third. Humeral callus prominent, developed to the anterior and lateral margins of the elytra, interrupting the epipleura. Epipleura interrupted at the base by the humeral callus but continuous flat and elevated.

Metasternum. Metaventral process broad, slightly projecting; metasternum uniform and deeply punctate (Fig. 10C).

Abdomen. Sternites 1, 2 and 3 almost equal in length. Surface with uniform, dense and deep punctation, separated by one puncture diameter (more dispersed on anal plate), sub-oval transverse (Fig. 10C).

Legs. Protibia thick; distal denticle long, slightly curved, with rounded apex. Protarsomeres 1–4 noticeably short and broad, successively slightly broader (Fig. 10E). Arrangement of ventral setae: 3 spines on each protarsomere, from very short to long, and a thin and long outer seta. Protarsomere 5th robust, broad, almost equal to tarsomeres 1–4 together. Ventral lobe well developed, in subapical-internal

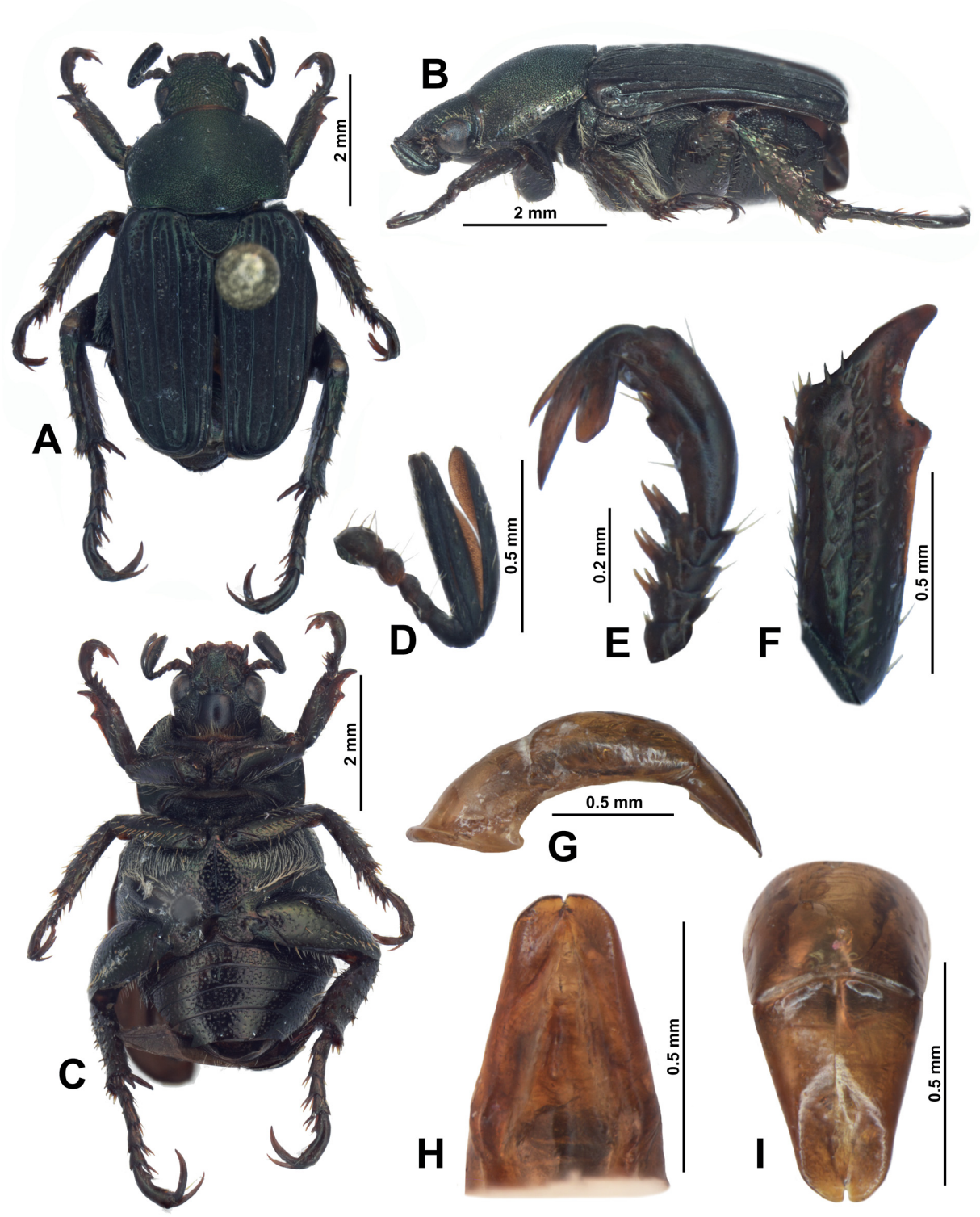

Fig. 10. *Strigoderma* (*Costatergus*) *grossipenis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

position. The inner protarsal claw broad and deeply notched: lower ramus rhomboidal, reaching half the length of upper ramus (Fig. 10E). Mesotibia thickened towards the middle; apex with 10–11 short spines. Surface with two transverse setiferous carinae; the upper one with 4 to 5 thick and long spines; the lower one with 6–7 long spines. Sculpture with moderate, deep and irregular punctation. Apical spurs straight: the inner one with acute apex, as long as the first two tarsomeres; the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 short and broad, slightly thickened towards the apex. Dorsal setae pattern: first three tarsomeres with 3 long, moderately thick spines and the fourth mesotarsomere with two very thin and very long setae. Ventral setae pattern: all tarsomeres with 4 spines, on each tarsomere the arrangement of spines is moderately long to long and thick. Metatibia clearly widened towards the apical part; apex with 12–13 moderately short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 thick spines; the middle one with 5–6 moderate spines, the distal one with 8–9 moderately long spines. Sculpture with large and irregular punctation, like an impression. Apical spurs straight: the inner one with a rounded apex, as long as the first one plus part of the second tarsomere; the outer one with a rounded apex, slightly shorter than the first mesotarsomere. Metatarsomeres thickness increases gradually towards apex; length is variable, but second metatarsomere is prominent. Dorsal setae pattern: first and second metatarsomere with two moderately long spines, the inner one slightly thinner than the outer one; third metatarsomere with two moderately long and moderately thick spines; fourth metatarsomere with one long, thin setae. Ventral setae pattern: four long spines on each tarsomere, but their thickness decreases successively on each tarsomere.

Genitalia. Parameres short, with the outer margin slightly curved, slightly narrower before the apex; apices broadly rounded (Fig. 10H–I). Apical form (lateral view) subtly curved ventrally (Fig. 10G).

Variation. The reflections on head, pronotum and forelegs are less intense. Other features are not apparent due to the age and condition of the specimen.

Female

Unknown.

Distribution

This species has only been recorded from the type locality, in the Sierra Sur of the state of Guerrero, on the Acapulco-Zihuatanejo highway (Municipality Tecpan de Galeana). This area belongs to the "Sierra Sur de Guerrero" Terrestrial Priority Conservation Region (RTP-117, Arriaga *et al*. 2000), characterized by being an isolated area of high endemism and species richness. The locality comprises medium and low altitude forests, although pine forests, oak forests and cloud forests are also found in the region (Fig. 14).

Natural history

Feeding habits and life cycle are unknown. The holotype was collected in November.

Taxonomic comments

This species is most similar to the nominal species, *S.* (*C.*) *costulipennis*, both from the state of Guerrero. They share the maximum number of elytral ridges and are the only ones with the two external ridges convergent in the apical third (besides *S.* (*C.*) *vulcanica* sp. nov.). However, they differ in the presence of ridge 6 in the basal area of the elytra (absent in *S.* (*C.*) *costulipennis*), fine and very dense punctation (wider and thicker in *S.* (*C.*) *costulipennis*), the wide intercoxal space of the mesosternum (narrow in *S.* (*C.*) *costulipennis*), in addition to the short, wide parameres, with almost straight external margins (thin and long parameres, widely curved on the external margins in *S.* (*C.*) *costulipennis*).

Strigoderma* (*Costatergus*) *uniungula Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
urn:lsid:zoobank.org:act:BB76569E-0C28-4081-B960-7E530B779529
Figs 1F, 2F, N, 3F, 4F, 11, 14

Diagnosis

Simple inner protarsal claw. Elytra with inter-costal space markedly punctate.

Etymology

From the Latin numerical prefix '*uni*' ('one'), and from the Latin '*ungula*' ('claw, spur or hoof'), in reference to the fact that this species is the only one with a simple internal protarsal claw.

Type material

Holotype

MEXICO – **Guerrero** • ♂; "8 miles sw. Iguala, gro., Mexico. VII-10-66. P. M. & P. K. Wagner; // T A & M; // TAMU – ENTO X0043336 "barcode"; // *Strigoderma costulipennis* Bates., Det. A. Bader 1989; // *Strigoderma* (*Costatergus*) *uniungula* Andalco-Cid & Ramírez-Ponce, 2025 HOLOTYPE" [red label, printed]; TAMU.

Description

Body size. Total length: 7.17 mm. Maximum elytral width: 3.30 mm (Fig. 1F).

Body colour. Antennal club, pronotum, scutellum and abdomen black with coppery-greenish reflections, apex of protibia and tarsi slightly reddish (Fig. 11A–C).

Clypeus. Markedly trapezoidal, elongate. Anterior angles rounded; anterior edge sinuate; external margin slightly elevated. Surface with shallow anterolateral excavation on each side. Punctation very broad, rough, deep and dense (Fig. 2F).

Frons. Slightly convex, with a lateral depression at the base of the suture. Sculpture roughly-punctate, similar to the clypeus (Fig. 2F).

Antenna. 1st to 3rd flagellomeres similar in length and thickness; club slightly longer than the pedicel and funiculus together (Fig. 11D).

Pronotum. Shape sub-quadrangular, nearly as wide as long; broadened on anterior half. Anterior angles slightly projecting. Surface without longitudinal median groove. A cluster of 3–5 setae on each side of anterior half. Mixed punctation; larger and sparser toward anterior margin and smaller and denser toward posterior margin; heterogeneous (Fig. 2N). Lateral figure markedly convex (side view) (Fig. 11B).

Scutellum. Rounded with thickened edge. Sculpture with punctation less wide than that of the pronotum, denser and deeper.

Elytra. Subparallel to the 2nd third. Surface with seven elevated ridges; all complete, except the third one developed to the elytral half (Fig. 3F). Ridges six and seven not convergent in the distal third to form a single one (Fig. 4F). Space between ridges notable and irregularly punctate, wide and poorly defined points. Elytral suture elevated to the 2nd distal third. Humeral callus prominent, developed to the anterior and lateral margins of the elytra, interrupting the epipleura. Epipleura interrupted at the base by the humeral callus but continuous, flat and elevated.

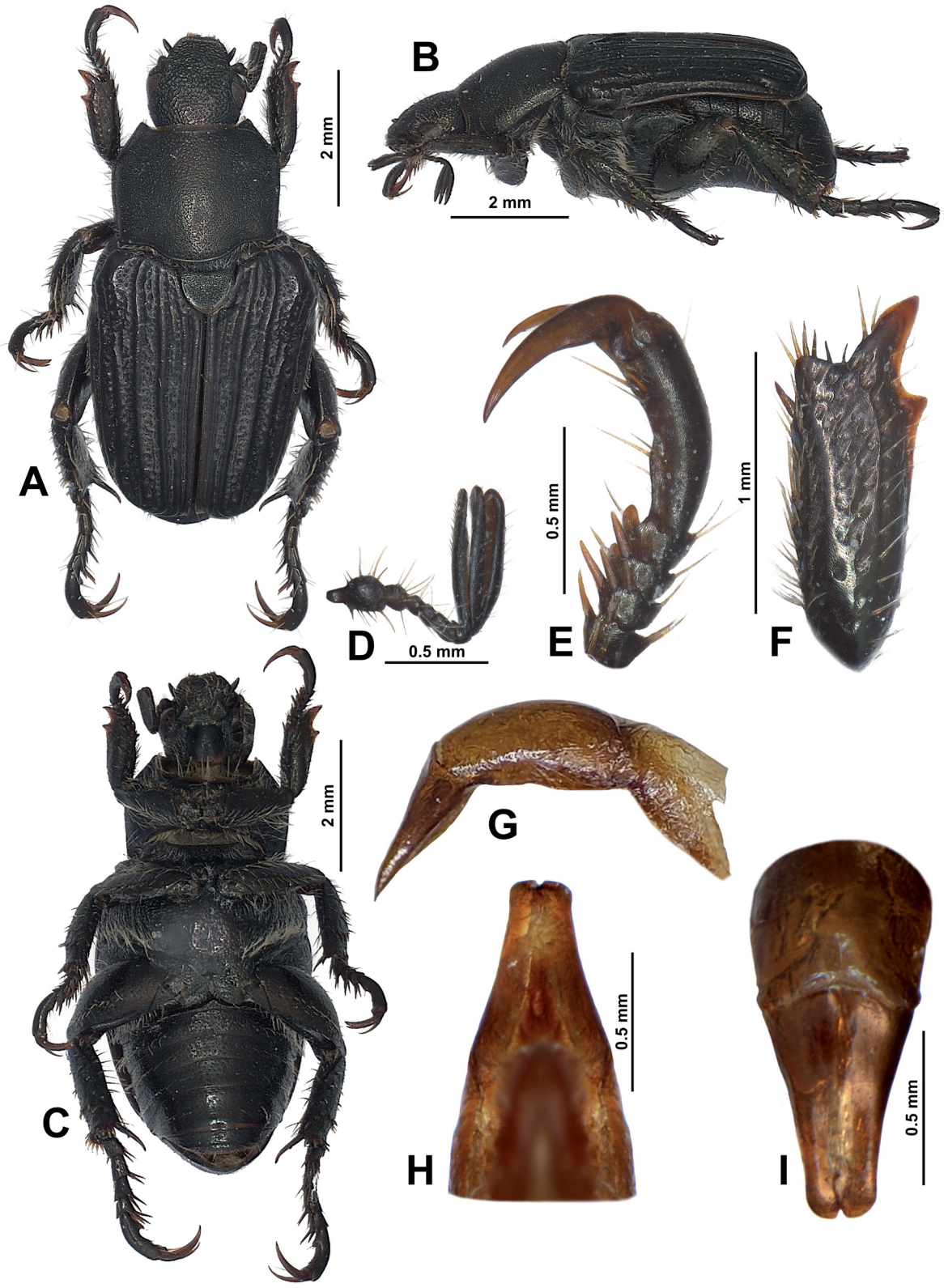

Fig. 11. *Strigoderma* (*Costatergus*) *uniungula* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (TAMU). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

Metasternum. Metaventral process narrow, slightly projecting; metasternal process uniform and deeply punctate (Fig. 11C).

Abdomen. Sternites 1, 2 and 3 sub-equal in length. Surface with uniform punctation, separated by one puncture diameter (more dispersed on anal plate), sub-rounded, shallow (Fig. 11C).

Legs. Protibia very thick; distal denticle long, almost straight, with acute apex (Fig. 11F). Protarsomeres 1–4 noticeably short and broad, successively slightly broader (Fig. 11E). Arrangement of ventral setae: 3 spines on each protarsomere with very short to long arrangement and a long thin outer seta. Protarsomere 5 somewhat thin, longer than tarsomeres 1–4 together. Ventral lobe very poorly developed, in sub-basal-internal position. Inner protarsal claw simple, not split (Fig. 2C). Mesotibia thickened towards the middle; apex with 10–11 short spines. Surface with two transverse setiferous carinae; the upper one with 4–5 thick and long spines; the lower one with 6–7 long spines. Sculpture with moderate, deep and irregular punctation. Apical spurs straight: the inner one with acute apex, as long as the first two tarsomeres; the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 short and wide, slightly thickened towards the apex. Dorsal setae pattern: first three tarsomeres with 3 long, moderately thick spines; fourth mesotarsomere with two very thin and very long setae. Ventral setae pattern: all tarsomeres with 4 long spines, progressively longer and thicker. Metatibia clearly widened towards the apical part; apex with 12–13 moderately short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 thick spines; the middle one with 5–6 moderate spines, the distal one with 8–9 moderately long spines. Sculpture with large and irregular punctation, like an impression. Apical spurs straight: the inner one with a rounded apex, as long as the first one plus part of the second tarsomere; the outer one with a rounded apex, slightly shorter than the first mesotarsomere. Metatarsomeres slightly thicker towards the apex; length is variable, but the second one stands out. Dorsal setae pattern: first and second metatarsomere with two moderately long spines, the inner one slightly thinner than the outer one; third metatarsomere with two moderately long and moderately thick spines; the fourth metatarsomere with a long, thin setae. Ventral setae pattern: each metatarsomere with four long spines, the thickness of which decreases progressively.

Genitalia. Parameres long and slender, with the outer margin slightly curved, slightly narrower before the apex; rounded apices (Fig. 11H–I). Apical figure (lateral view) slightly curved ventrally (Fig. 11G).

Female

Unknown.

Distribution

This species has only been recorded from the type locality, Iguala, Guerrero (650 m a.s.l.), characterized by low deciduous forest vegetation. This area belongs to the "Sierras de Taxco-Huautla" Terrestrial Priority Region for Conservation (RTP-120, Arriaga *et al*. 2000), characterized as a biological corridor with high ecological integrity and high biological richness (Fig. 14).

Natural history

Feeding habits and life cycle are unknown. The holotype was collected in July.

Taxonomic comments

This species is easy to distinguish as it is the only one with a simple inner protarsal claw. It shares with *S.* (*C.*) *paucipunctata* sp. nov. the same intercostal area with wide punctation, however, they are differentiated by the more marked intercostal punctation (shallow in *S.* (*C.*) *paucipunctata*), as well as the pronotum with the densest punctation and with coppery reflections (pronotum with less dense punctation and intense greenish reflections in *S.* (*C.*) *paucipunctata*).

Strigoderma* (*Costatergus*) *vulcanica Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
urn:lsid:zoobank.org:act:5FBF7775-AB91-4D47-80F2-595DB0D5995A
Figs 1G, 2G, Ñ, 3G, 4G, 12, 14

Diagnosis

Elytra with eight elevated ridges; ridges 3rd, and 5th only marked at base; ridges seven and eight convergent in distal third. 5th protarsomere with barely perceptible preapical denticle. Inner protarsal claw with lanceolate lower ramus, longer than half the length of upper ramus. Short parameres, with almost straight outer margin, and broad, widely rounded apices.

Etymology

The specific epithet refers to the locality site where the type series was collected, "Volcán de Colima". From the Latin '*Vulcānus*' (Vulcan: Roman god of fire; 'volcano'), and the noun suffix '*ica*' (to denote the geographic region where the species is found); *vulcanica*, inhabitant of the volcano.

Type material

Holotype

MEXICO – **Colima** • ♂; "C. C. Hoffman, Cólima, VII-1916, 023; // *Strigoderma costulipennis* Bates 1888, Det. A. Bader, Coll. Change; // Field Museum // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2021 HOLOTYPE ♂" [red label, printed]; CNHM.

Paratypes (6 ♂♂, 6 ♀♀)

MEXICO – **Colima** • 3 ♂♂; **"**México, Coll. Lange (handwritten); // Specimen orig. without labels in colln. but associated with specimen bearing attached data; // *Strigoderma costulipennis* Bates, Det. A. Bader 1989; // CNHM 1955, Karl Brancsik Colln. ex Eduard Knirsch; // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♂" [yellow label, printed]; CNHM • 1 ♂; "Colima, Colima. MEX. Mex., VIII-I-41; // Col. & pres by. C. H. Seevers; // *Strigoderma costulipennis* Bates 1888, Det. A. Bader 1989; // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♂" [yellow label, printed]; CNHM • 1 ♀; "México, Coll. Lange // CNHM 1955, Karl Brancsik Colln. ex Eduard Knirsch // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♀" [yellow label, printed]; CNHM • 2 ♀♀; "Colima Vulcano Mex / L. Conrad // USNM // Ohaus determ. *Strigoderma costulipennis* ♀ W. Bts. // *Strigoderma costulipennis* Bates, Det. A. Bader 1989 // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♀" [yellow label, printed]; USNM • 1 ♀; "Colima, Col. Mex. Conradt // USNM // Ohaus determ. *Strigoderma costulipennis* ♀ W. Bts. // *Strigoderma costulipennis* Bates, Det. A. Bader 1989 // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♀" [yellow label, printed]; USNM • 1 ♂; "C. C. Hoffman, Colima, VII, 1916 // C. C. Hoffman, det. 023 // IBUNAM: CNIN: CO45138 (barcode) // 45138 (QR code) // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATPE ♂" [yellow label printed]; CNIN • 1 ♂; "C. C. Hoffman Colima VII-1916 // IBUNAM: CNIN: CO45127 (barcode) // 45127 (QR code) // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♂" [yellow label, printed]; CNIN • 1 ♀; "C. C. Hoffman Colima VII-1916 // IBUNAM: CNIN: CO45129 (barcode) // 45129 (QR code) // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♀ [yellow label, printed]; CNIN • 1 ♀; "C. C. Hoffman Colima VII-1916 // IBUNAM: CNIN: CO45130 (barcode) // 45130 (QR code) // *Strigoderma* (*Costatergus*) *vulcanica* Andalco Cid & Ramírez Ponce, 2024 PARATYPE ♀" [yellow label printed]; CNIN.

Description

Body size. Total length: 6.31 mm. Maximum elytral width: 2.64 mm (Fig. 1G).

Body colour. Head, pronotum, scutellum black with coppery reflections. Elytra, legs, scape and pedicel intense yellow (Fig. 12A–B). Abdomen dark reddish black (Fig. 12C).

Clypeus. Subtrapezoidal, broad; anterior angles broadly rounded; anterior edge sinuates; margin slightly raised. Surface with a noticeable latero-apical excavation on each side. Punctation large, rough, deep and dense (Fig. 2O).

Frons. Convex. Sculpture with punctation slightly less dense than that of the clypeal (Fig. 2O).

Antenna. 1st to 3rd flagellomeres similar in length and thickness. Club slightly longer than pedicel and funiculus together (Fig. 12D).

Pronotum. Subtrapezoidal, distinctly broader than long; markedly widened in anterior half. Anterior angles short. Surface without longitudinal median groove. Punctation small, dense, somewhat heterogeneous, almost rough (Fig. 2O). Lateral figure moderately convex (side view) (Fig. 12B).

Scutellum. Wide. Sculpture with wide and deep punctation similar to the pronotum.

Elytra. Subparallel to 2nd third. Surface with eight elevated ridges; 3rd, 4th and 6th incomplete (only marked at base of elytra) (Fig. 3G); ridges 8 and 9 convergent, forming only one in distal third (Fig. 4G). Elytral suture elevated to distal 2nd third. Humeral callus discrete, developed to lateral margins of elytra, interrupting epipleura. Epipleura thin and elevated.

Pygidium. Broader than long, with a broadly rounded apex. Form (side view) noticeably convex in the median part. Sculpture punctation dense, oblique, small and deep. Vestiture with sparse short, thin, transparent setae over the apical area.

Metasternum. Metaventral process broad, slightly projecting; metasternal dense and deeply punctate (Fig. 12C).

Abdomen. Sternites 1, 2, and 3 almost the same size. Sternite 4 as thick as the third sternites plus a part of any of the first three. Surface with uniform and small punctation, separated by two puncture diameters (more dispersed on anal plate), sub-rounded and shallow (Fig. 12C).

Legs. Protibia little thick; distal denticle long, slightly curved, with rounded apex (Fig. 12F). Protarsomeres 1–4 noticeably short and somewhat widened, progressively slightly longer (Fig. 12E). Arrangement of ventral setae: protarsomeres 1 and 2 with 3 moderately thin spines and one seta; protarsomeres 3 and 4 with three short to long, stout spines. Protarsomere 5 slender, longer than tarsomeres 1–4 together. Ventral lobe barely visible, in inner sub-apical position. Inner protarsal claw deep and narrowly cleft: lower ramus lanceolate, half the length of the upper ramus (Fig. 12E). Mesotibia gradually thickened in the middle; apex with 12–13 short spines. Surface with two transverse setiferous carinae; the upper one with 3–4 thick and short spines; the lower one with 6–7 long spines. Surface with large and irregular punctate print-like markings. Apical spurs straight: the inner one with acute apex, as long as the first one plus part of the second tarsomere; the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 similar in length and thickness. Dorsal setae pattern: mesotarsomeres 1 with 2 thin spines, one short and one very long; mesotarsomeres 2, 3 and 4 with 2 thin and long setae. Ventral setae pattern: mesotarsomeres 1, 2 and 3 with 3 spines that are very thick to moderately thick, short to long; mesotarsomere 4 with 2 moderately thin and moderately long spines and 1 seta. Metatibia clearly widened in the middle and apical part; apex with 14–15 short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 moderately thick and moderately long spines; the middle one with 4–5 moderate spines; the distal one with 8–9 moderately thick and moderately

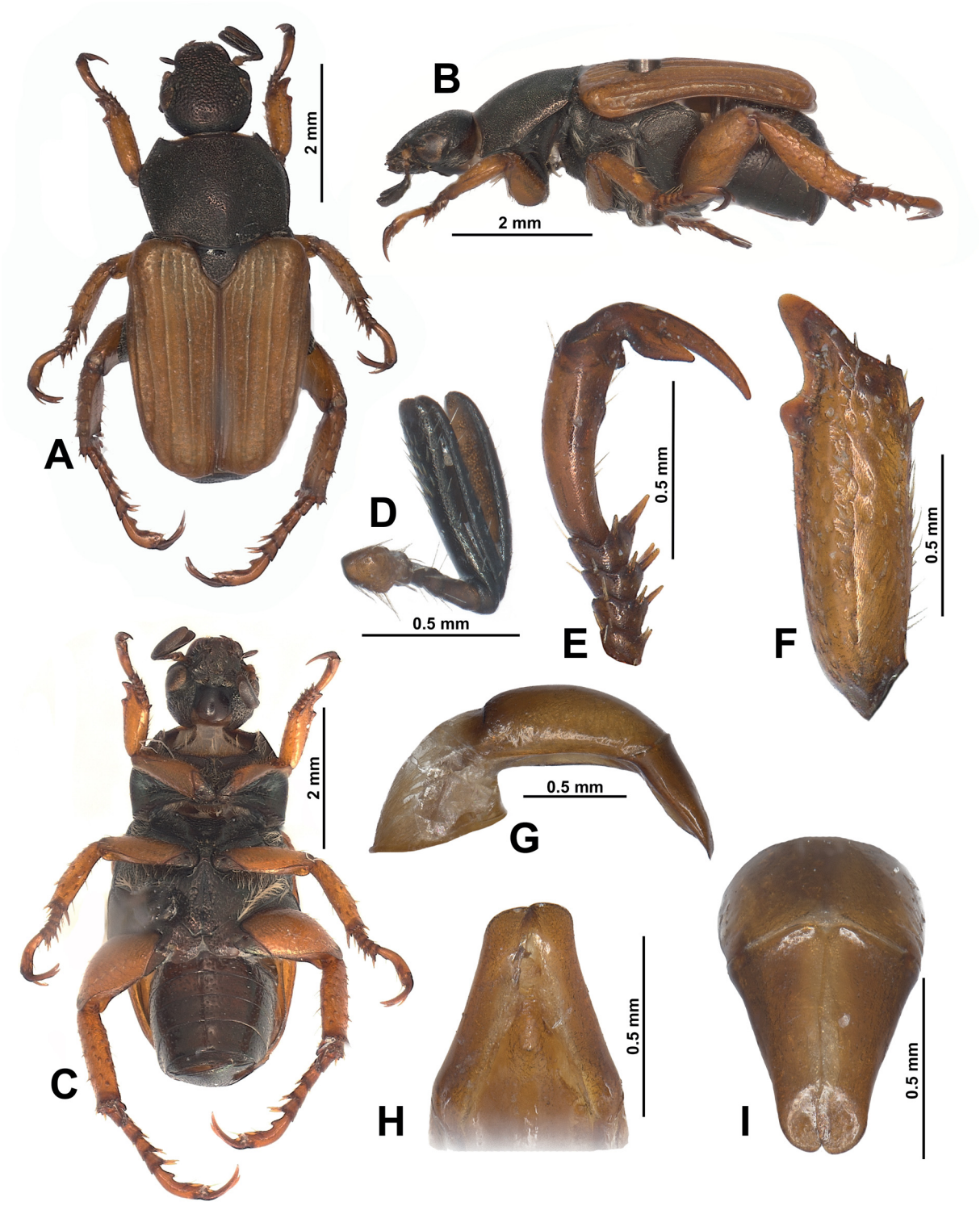

Fig. 12. *Strigoderma* (*Costatergus*) *vulcanica* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (CNIN). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

long spines. Apical spurs straight: the inner one with rounded apex, as long as the first two tarsomeres; the outer one with rounded apex, slightly longer than the first mesotarsomere. Metatarsomeres with similar thickness and successively decreasing length. Dorsal setae pattern: metatarsomeres 1 to 3 with 1 moderately thick spine and 1 moderately thin seta; metatarsomere 4 with two long, thin setae. Ventral setae pattern: metatarsomeres 1 and 2 with 4 long, thick spines; metatarsomere 3 with 3 spines and two long, moderately thick setae; metatarsomere 4 with 2 moderately long, thick spines and 2 setae.

Genitalia. Parameres short, with the outer margin slightly curved, slightly narrower before the apex; apices broadly rounded (Fig. 12H–I). Apical figure (lateral view) slightly curved ventrally (Fig. 12G).

Variation. Pronotum with slightly more or less dense punctation and coppery or greenish reflections. Elytra completely bright yellow or with a complete longitudinal stripe covering from the penultimate ridge and another central longitudinal spot. Legs bright-yellow, ochre-yellow or black.

Female

Similar to holotype, except by: antennal club slightly shorter. Pronotum with finer punctation, less dense and deeper posteriorly; external elytral ridge noticeably wider, mainly at base; penultimate elytral ridge poorly developed. Abdomen noticeably inflated. Protibia with more elongated and curved distal denticle; thinner protarsi and internal protarsal claw with lower and upper ramus similar in thickness and length.

Distribution

This species is only known from Colima ('volcan'). It was probably collected on the periphery of the geological body where dry tropical vegetation exists (Fig. 14).

Natural history

Feeding habits and life cycle are unknown. Specimens were collected in July and August.

Taxonomic comments

This species presents the greatest similarity with *S.* (*C.*) *costulipennis* and *S.* (*C.*) *grossipenis* sp. nov., since they share the convergent arrangement in the distal third of the external elytral ridges, however, they differ in the presence of eight elytral ridges (10 in *S.* (*C.*) *grossipenis*); internal protarsal claw with both rami very close (clearly separated in *S.* (*C.*) *costulipennis* and *S.* (*C.*) *grossipenis*); and short and thick parameres (thin in *S.* (*C.*) *costulipennis*).

Strigoderma* (*Costatergus*) *borealis Andalco-Cid & Ramírez-Ponce subgen. et sp. nov.
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Figs 1H, 2H, O, 3H, 4H, 13–14

Diagnosis

Pronotum finely and densely punctate. Elytral ridges 3, 5 and 7 absent, 2nd complete but subtly defined. Inner protarsal claw with lower ramus reaching more than half the length of upper ramus. Parameres very short and broad.

Etymology

From the Latin adjective '*borealis*' ('relating to the north or boreas'), as this species has the most northerly distribution of any species described so far.

Type material

Holotype

MEXICO – **Nayarit** • ♂; "Jesús María Nayarit, MEX. VII-6-1955 // B. Malkin Collector // SCARABAEIDAE: ANOMALINAE *Strigoderma costulipennis* Bates ♂, Det: R W L Potts, 1977 // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 HOLOTYPE ♂" [red label, printed]; EMEC.

Paratypes (4 ♂♂, 2 ♀♀)

MEXICO – **Nayarit** • 1 ♂, 1 ♀; "Jesús María Nayarit, MEX. VII-6-1955 // B. Malkin Collector // UCB // UC Berkeley EMEC 1324373 (female specimen with 1324376) "QR code" // *Strigoderma costulipennis* Bates, Det. A Bader 1989 // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE" [yellow label, printed]; EMEC • 1 ♂; "Arroyo Canaveral nr. Jesus Maria Nay. MEX. VII-15-55 // B. Malkin Collector // UC Berkeley EMAC 1324369 "QR code" // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE ♂" [yellow label, printed]; EMEC • 1 ♂; "Arroyo Canaveral nr. Jesus Maria Nay. MEX. VII-15-55 // B. Malkin Collector // UC Berkeley EMAC 1324370 "QR code" // *Strigoderma costulipennis* Bates, Det. H. F. HOWDEN // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE ♂" [yellow label, printed]; EMEC • 1 ♀; "MEX. Nay. Jesús Maria VII-27-55 / B. Malkin Collector // UC Berkeley EMEC 1324372 "QR code" // UCB // *Strigoderma costulipennis* Bates, Det. A Bader 1989 // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE ♀" [yellow label, printed]; EMEC • 1 ♂; "Arroyo Santiago nr. Jesús Maria Nay. MEX. VII-5-55 // B. Malkin Collector // UCB // UC Berkeley EMEC 1324371 "QR code" // *Strigoderma costulipennis* Bates, Det. A Bader 1989 // *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce, 2025 PARATYPE ♂" [yellow label, printed]; EMEC.

Description

Male holotype

Body size. Total length: 6.56 mm. Maximum elytral width: 2.95 mm (Fig. 1H).

Body colour. Body completely black, except for a wide orange spot on the first third of each elytra; tibiae apically reddish and tarsi and claws with deeper reddish tone (Fig. 13A–C).

Clypeus. Subrectangular, broad. Anterior angles broadly rounded; anterior edge slightly sinuate; outer margin weakly raised. Surface with a shallow anterolateral excavation on each side. Punctation very wide, rough, deep and dense (Fig. 2H).

Frons. Almost flat. Rough-punctate sculpture, similar to that of the clypeal in the central area (Fig. 2H).

Antenna. 3rd flagellomere longer than the previous ones. Club almost as long as the pedicel and funiculus together (Fig. 13D).

Pronotum. Subtrapezoidal, broader than long; markedly widened in anterior half. Anterior angles short, and lateral margins broadly rounded. Surface without longitudinal median groove. Punctation small, very dense, homogeneous, fine (Fig. 2P). Lateral figure markedly convex (side view) (Fig. 13B).

Scutellum. Sub-rounded with thickened edge. Sculpture with a width slightly less than that of the pronotum, denser and deeper.

Elytra. Subparallel to 2nd third. Surface with seven elevated ridges; 3rd ridge only marked at base of elytra (Figs 3H, 4H). Inter-costal space very wide, subtly irregular, without defined punctation. Elytral

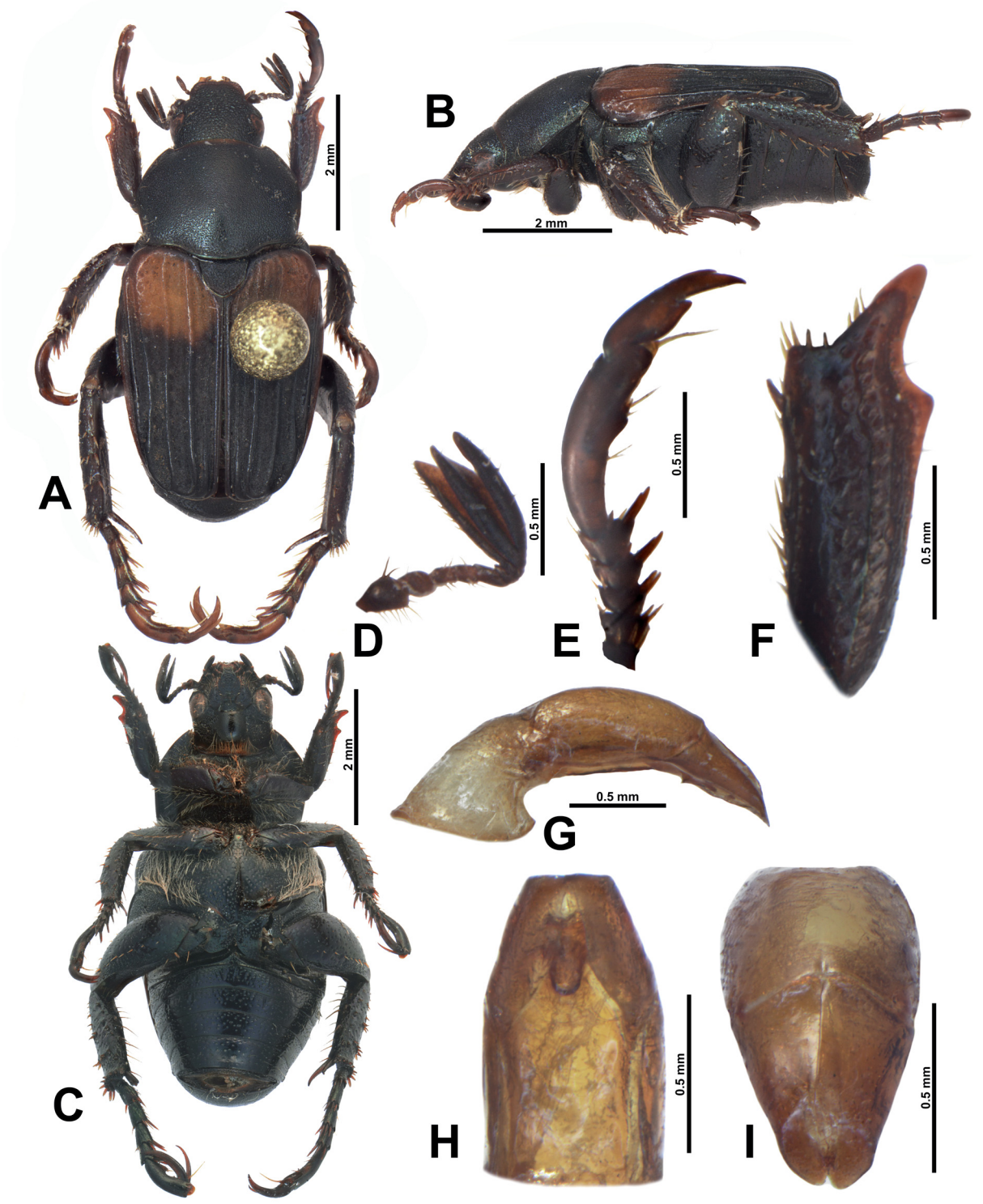

Fig. 13. *Strigoderma* (*Costatergus*) *borealis* Andalco-Cid & Ramírez-Ponce subgen. et sp. nov., holotype, ♂ (EMEC). **A**. Dorsal habitus. **B**. Ventral habitus. **C**. Lateral habitus. **D**. Antenna. **E**. Protarsus. **F**. Protibia. **G–I**. Genitalia. **G**. Lateral view. **H**. Ventral view. **I**. Frontal view.

suture elevated to distal 2nd third. Humeral callus prominent, developed to anterior and lateral margins of elytra, interrupting epipleura. Epipleura interrupted at base by humeral callus but continuous, flat and elevated.

Metasternum. Metaventral process broad, slightly projecting; metasternum scattered and shallowly punctate (Fig. 13C).

Abdomen. Sternites 1, 2 and 3 almost equal in length. Sternite 4 as thick as the third sternites plus ½ of any of the first three. Surface with uniform punctation, separated by one puncture diameter (more dispersed on anal plate), oval transverse, broad and shallow (Fig. 13C).

Legs. Protibia very thick; distal denticle long, almost straight, with rounded apex (Fig. 13F). Protarsomeres 1–4 noticeably short and broadened, successively slightly broader (Fig. 13E). Arrangement of ventral setae: protarsomeres with 3 spines, very short to long and a long thin outer seta. 5th protarsomere slightly thin, longer than tarsomeres 1–4 together. The ventral lobe developed, in internal sub-apical position. Inner protarsal claw narrow and shortly cleft: lower ramus lanceolate, reaching more than half the length of upper ramus (Fig. 13E). Mesotibia thickened towards the middle; apex with 10–11 short spines. Surface with two transverse setiferous carinae; the upper one with 4–5 thick and long spines; the lower one with 6–7 long spines. Sculpture with moderate, deep and irregular punctation. Apical spurs straight: the inner one with acute apex, as long as the first two tarsomeres;

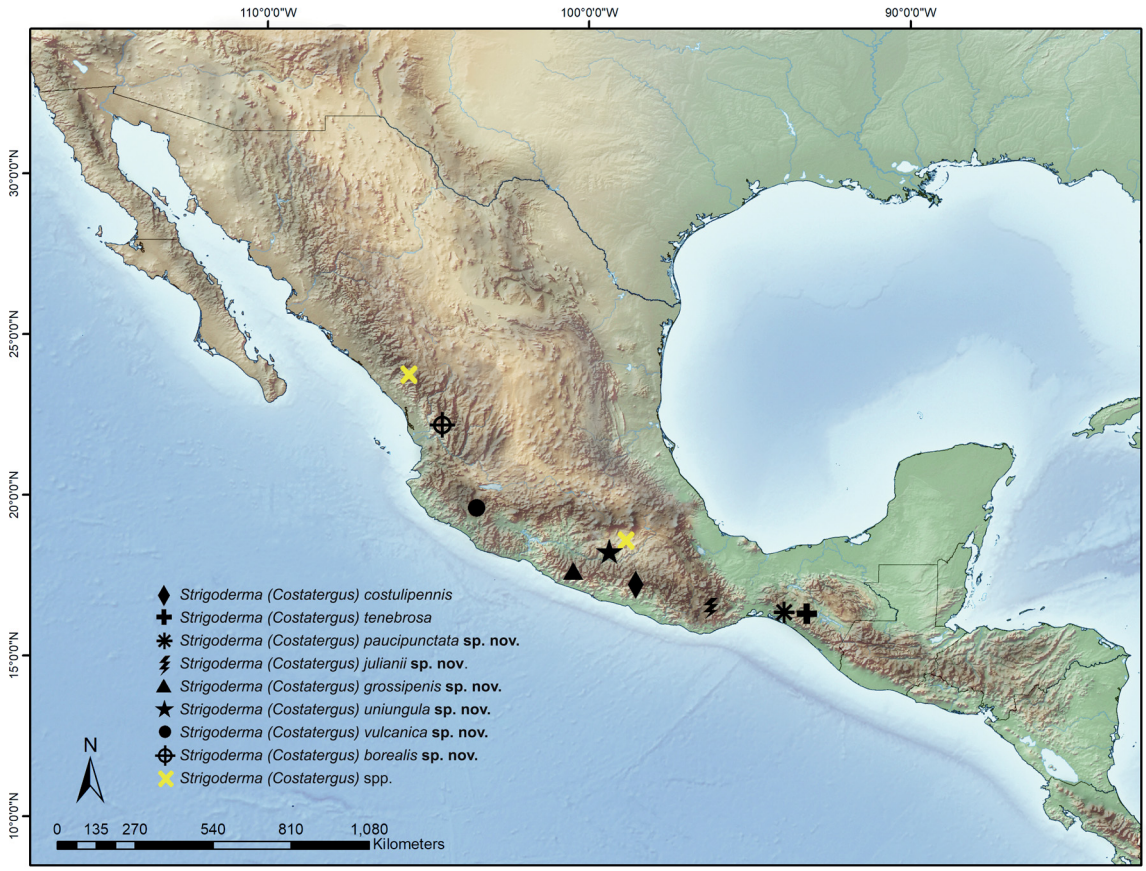

Fig. 14. Geographic distribution of the species of the subgenus *Strigoderma* (*Costatergus*) Ramírez Ponce & Andalco Cid subgen. nov.

the outer one with acute apex, of similar length to the first mesotarsomere. Mesotarsomeres 1–4 short and broad, slightly thickened towards the apex. Dorsal setae pattern: first three tarsomeres with 3 long, moderately thick spines and the fourth tarsomere with two very thin and very long setae. Ventral setae pattern: tarsomeres with 4 spines, on each tarsomere the arrangement of spines is moderately long to long and thick. Metatibia clearly widened towards the apical part; apex with 12–13 moderately short spines. Surface with three transverse setiferous carinae: the proximal one with 2–3 thick spines; the middle one with 5–6 moderate spines, the distal one with 8–9 moderately long spines. Sculpture with large and irregular punctation, like an impression. Apical spurs straight: the inner one with a rounded apex, as long as the first one plus part of the second tarsomere; the outer one with a rounded apex, slightly shorter than the first mesotarsomere. Metatarsomeres thickness increases gradually towards apex; length is variable, but the second is prominent. Dorsal setae pattern: first and second metatarsomeres with two moderately long spines, the inner one slightly thinner than the outer one; third metatarsomere with two moderately long and moderately thick spines; fourth metatarsomere with one long, thin seta. Ventral setae pattern: four long spines on each tarsomere, but the thickness of these decreases successively with the number of tarsomeres.

Genitalia. Parameres very short, with the outer margin slightly curved, slightly narrower before the apex; apices broadly rounded (Fig. 13H–I). Apical figure (lateral view) curved ventrally (Fig. 13G).

Variation. There is little variation in the size of the pronotal punctures. The colour of the pronotum may have intense greenish reflections, and the orange spots on the anterior part of the elytra may be absent, or only faintly marked on the elytral margin.

Female

Similar to holotype except for the following differences: head with antennal club shorter. Pronotum punctuation much smaller and less dense, mainly towards the posterior portion, where there are smooth areas close to the margin. Elytra with outer ridge strongly thickened across its length. Abdomen noticeably inflated. Anterior protibia with longer and curved distal denticle. Protarsomeres 1–4 thinner; inner protarsal claw with the upper ramus slightly longer, but both of similar thickness.

Distribution

This species has only been collected at the type locality, Jesús María Nayarit (approximately 500 m a.s.l.), in the north of the state (Fig. 14).

Natural history

Its feeding habits and life cycle are unknown. Adults were collected in June and July.

Taxonomic comments

This species has the greatest morphological similarity to *S.* (*C.*) *tenebrosa* and *S.* (*C.*) *juliani* sp. nov., since they are characterized by having ridges 3, 5, and 7 (also ridge 2 in the case of *S.* (*C.*) *juliani*) absent or only marked at the base of the elytra, such that the defined ridges appear very separated, in addition to the unpunctuated inter-costal space. However, *S.* (*C.*) *borealis* sp. nov. is distinguished by having the lower ramus of the inner protarsal claw clearly longer than half the length of the upper ramus (shorter than half the upper ramus in *S.* (*C.*) *tenebrosa* and *S.* (*C.*) *juliani*), and very short and wide parameres at the apex (long and thin in *S.* (*C.*) *tenebrosa* and *S.* (*C.*) *juliani*).

Discussion

Considerations of the affinities between species of the genus *Strigoderma* with unusual or unique characters, such as *S. costulipennis*, have generated disparate opinions not only about the importance and evolutionary correspondence of certain isolated characters, but also on the affinities between species. As

a result, *S. costulipennis* has been grouped with other species based on superficial features. For instance, with *S. costulata* (Nonfried 1893), with small species, such as *S. floricola*, *S. marginata* or *S. villosella* (Machatschke 1972), or, with *S. tomentosa* (Bader 1992), for the apparent tomentose similarity of the dorsum and the presence of the elytral ridges.

The discovery of new species related to *S. costulipennis* demonstrates that their distinctive characters are not unique, but shared characters that define a group of unnoticed or confused species, even in the revision of the genus by Bader (1992). These shared characters, possibly synapomorphies, justify the description of this subgenus to accommodate all these similar species.

A comparative morphological analysis with the rest of the species of *Strigoderma* reveals several characters shared with some species of the heterogeneous "*pygmaea*" group defined by Machatschke (1972). However, the similarities are not necessarily due to small body size; some species within this group have been linked to or proposed as new genera, for example, *S. teapensis* (similar to *Balanogonia* Paucar-Cabrera, 2003) (Paucar-Cabrera 2003), and *S. villosella* (now as genus *Lamoana* Casey, 1915) (Casey 1915; Madrigal *et al.* 2023), considering as shared characters the elongated sub-hexagonal pronotum, the lanceolate lower ramus of the internal claw, and the very simple parameres shorter than the tectum.

Various unusual species and genera, even with palaeotropical distribution, have been associated with *Strigoderma* throughout the extensive literature on the classification of Anomalini (Blanchard 1851; Bates 1888; Nonfried 1893; Casey 1915; Madrigal *et al.* 2023); therefore, a phylogenetic inference that allows us to know the true boundaries of the genus and the taxonomic utility of the traditional characters used in the classifications is necessary.

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