J. Insect Biodiversity 018 (1): 001–016
https://www.mapress.com/j/jib

Article

ISSN 2538-1318 (print edition)
J. Insect Biodiversity
ISSN 2147-7612 (online edition)

https://doi.org/10.12976/jib/2020.18.1.1
http://zoobank.org/urn:lsid:zoobank.org:pub:EFFD8175-27CF-4EF8-B978-B84ABED17C93

Moss inhabiting flea beetles of the West Indies IV: new species of *Andersonaltica* Linzmeier and Konstantinov from the Dominican Republic (Coleoptera: Chrysomelidae: Galerucinae: Alticini)

ALEXANDER S. KONSTANTINOV[1,4], ADELITA M. LINZMEIER[2,5], SONJA J. SCHEFFER[3,6] & MATTHEW L. LEWIS[3,7]

[1] *Systematic Entomology Laboratory, USDA, c/o Smithsonian Institution, P. O. Box 37012, National Museum of Natural History, Washington, DC 20013-7012, USA.*
[2] *Universidade Federal da Fronteira Sul, Rua Edmundo Gaievski, 1000, P. O. Box 253, 85. 770-000, Realeza, PR, Brazil.*
[3] *Systematic Entomology Laboratory, USDA-ARS, 10300 Baltimore Av., Beltsville, MD 20705, USA.*
[4] *alex.konstantinov@usda.gov; https://orcid.org/0000-0001-6578-6735*
[5] *adelita.linzmeier@uffs.edu.br; https://orcid.org/0000-0002-2979-8728*
[6] *sonja.scheffer@usda.gov; https://orcid.org/0000-0003-0448-5319*
[7] *matthew.lewis@usda.gov; https://orcid.org/0000-0003-0215-0056*

Abstract

Two new species of bryobiont flea beetles (Coleoptera: Chrysomelidae: Galerucinae: Alticini) from Dominican Republic are described and illustrated: *Andersonaltica neiba* **sp. nov.** (Sierra de Neiba) and *A. villabarrancoli* **sp. nov.** (Sierra de Baoruco). New species are compared morphologically with each other. Unusual intraspecific variability of *A. villabarrancoli* is reported. To obtain additional data in understanding the similarities between the specimens of *A. villabarrancoli*, we sequenced the Cytochrome oxidase I barcode region of adults and larvae. In all cases, the sequences are identical suggesting that the specimens in questions are conspecific.

Key words: Bryobionts, COI barcodes, flea beetles, Monoplatina, moss cushions, species boundaries

Introduction

Moss cushions in the West Indies have proven to harbor remarkable diversity of flea beetles, revealing various patterns of beetle body shapes, colors, abilities to disperse (flightlessness) and speciation in general. Some allopatric species (e.g. *Borinken* Konstantinov & Konstantinova, 2011 and *Kiskeya* Konstantinov & Chamorro-Lacayo, 2006 in Puerto Rico) are substantially morphologically similar to each other. However, cytochrome oxidase I (COI) barcode sequence data indicate that the congeners are different well beyond the level typically considered reflective of distinct species (Konstantinov et al. 2020). Other allopatric congeners exhibit remarkable variation in beetle shapes, colors, patterns of setae and male genitalia, that makes them easy to recognize (Konstantinov & Linzmeier in press ZooKeys).

Beetles described in this paper, belonging to *Andersonaltica villabarrancoli*, presented a bit of a puzzle. They were all collected at Zapoten (northern slopes of Sierra de Baoruco) along about 300m of a road at about 1700m altitude in a variety of moss cushions on tree trunks and branches, rocks, and ground on both flat and semi-vertical sides of the road. Adults were initially sorted into a few species, but detailed examination of their external and internal structures indicated that they may be conspecific. Cytochrome oxidase I (COI) barcode sequences were identical for both adults and larvae of various morphs (see below). Therefore, despite substantial morphological variability, we consider specimens in question to be conspecific, although examples of the variations are described and illustrated.

Received: 22 May 2020; Accepted by Levent Gültekin: 18 Jun. 2020; published: 8 Jul. 2020

Material and methods

Dissecting techniques and terminology for most internal and external structures follow Konstantinov (1998). Specimen observations were made with a Zeiss Stemi SV11 Apo microscope. Digital photographs of morphological structures were taken with Axio Zoom V16 microscope and AxioCam HRC digital camera attached to it and with AxioCam HRC Zeiss attached to Leitz Diaplan compound microscope. Additional images were taken with Macropod Pro photomacrography system (Macroscopic Solutions, LLC, Tolland, CT, USA). The beetles are deposited in the following collections: National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), Collection of the Canadian Museum of Nature, Ottawa, Canada (CMNC) and Museo Nacional de Historia Natural, Santo Domingo, Dominican Republic (MHND).

Molecular Methods. *Andersonaltica villabarrancoli* were collected from moss cushions, placed directly into 96% ethanol, and subsequently stored at -28C prior to use. Genomic DNA from adult and larval individuals was extracted using the DNeasy Blood and Tissue Kit (Qiagen, Valencia, CA, USA). Polymerase chain reaction (PCR) amplification of the DNA barcode region of the mitochondrial Cytochrome oxidase I barcode region was performed using primers LCO and HCO (Folmer et al. 1994). PCRs were performed on a Tetrad 2 thermocycler (Bio-Rad, Hercules, CA, USA) with the following "touchdown" program: initial denaturation for two minutes at 92° C, 12 touchdown cycles from 58° C to 46° C (10 seconds at 92° C, 10 seconds at 58–46° C, one minute at 72° C), 27 cycles at 10 seconds at 92° C, 10 seconds at 45° C, one minute at 72° C, and a final extension for seven minutes at 72° C. PCR products were enzymatically purified for sequencing by using ExoSAP-IT (Affymetrix, Santa Clara, CA, USA). Sequences were generated with the amplifying primers by using the BigDye Terminator v3.1 Sequencing kit (Applied Biosystems, Foster City, CA) and fractionated on an ABI 3730XL Genetic Analyzer. Sequences were edited in Geneious R10 (Biomatters, New Zealand). Uncorrected pairwise distances between COI barcode sequences were calculated in Geneious. Sequences were deposited in GenBank under the following sample IDs: ASK0039 ASK0040 ASK0042 ASK0044 ASK0047 ASK0049 ASK0050 ASK0051.

Results

Molecular Results

COI barcode sequences of 658 bp were obtained from four larval and four adult individuals. The sequences of the eight beetles were identical.

Morphological Results

Andersonaltica Linzmeier & Konstantinov 2012

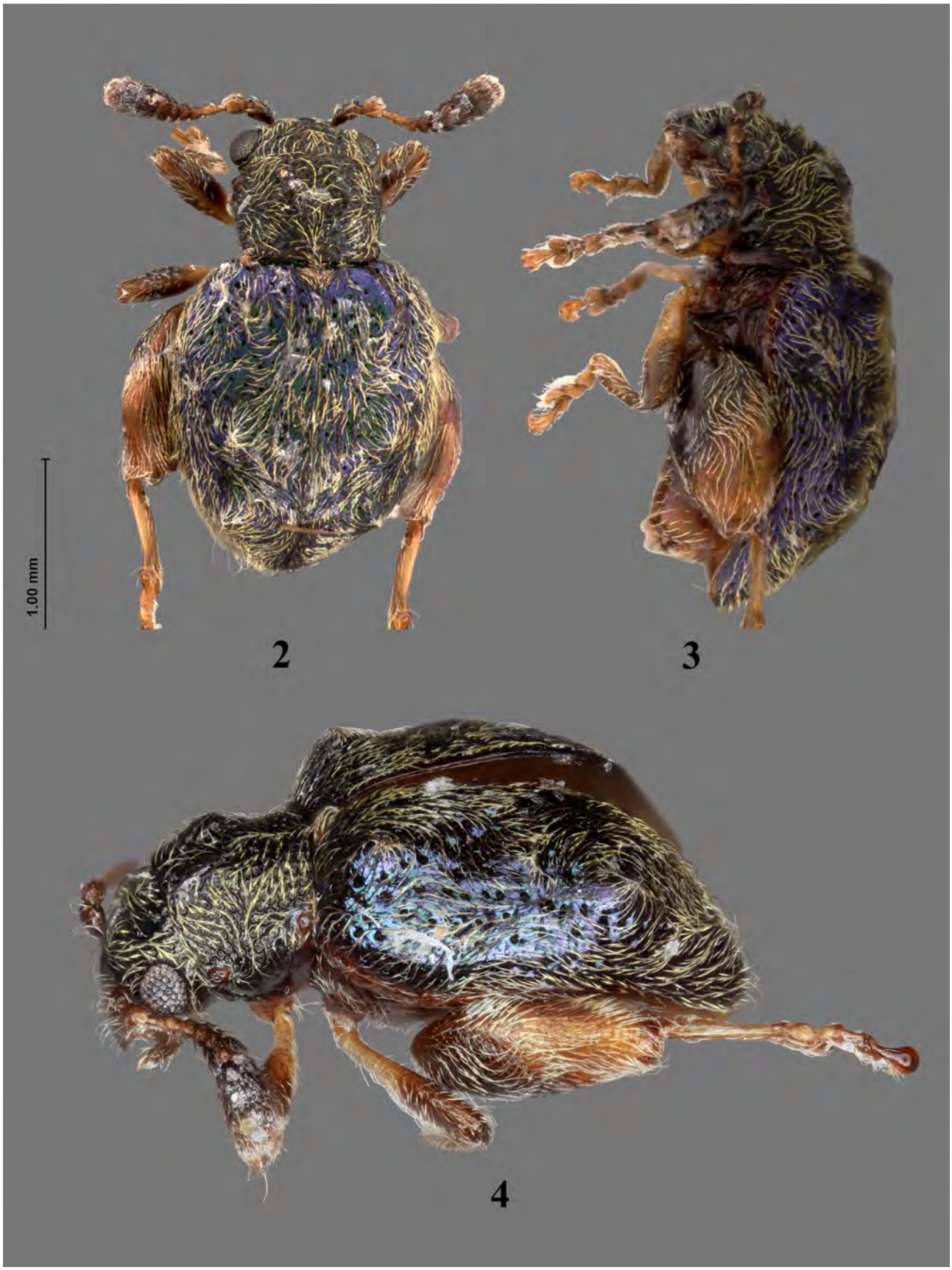
Andersonaltica Linzmeier & Konstantinov 2012:20 (type species *Andersonaltica pecki* Linzmeier and Konstantinov 2012:20, by original designation; type locality: Honduras: Comayagua/ Mont. Comayagua, 18.0km. E./ Comayagua, type depositary: CMNC).

Remarks. Before this paper, the only five species of *Andersonaltica* were known to inhabit leaf litter in Central America (Guatemala, Honduras, and Mexico). It is not a surprise that *Andersonaltica* species were also found in the West Indies, where they inhabit moss cushions. Examination of West Indian species of *Andersonaltica* revealed that antennomere 7 has an unusual bump on its front and slightly upper facing surface, this bump carries a large setiferous pore with a long seta and often is lighter in color than the rest of the antennomere. Also, antennomere 8 in one species is shorter than 9. Continental *Andersonaltica* species also have this feature. Upon further study the bump and setiferous pore was found in other moss inhabiting Monoplatines, *Erinaceialtica* Konstantinov & Linzmeier, in press and *Distigmoptera* Blake, 1943, although less apparent. But what is more remarkable is that the same bump with setiferous pore is present on the antennomere 7 of Asian moss inhabiting flea beetles of the genus *Cangshanaltica* Konstantinov *et al.* 2013 which belongs to a lineage very distant from Monoplatines.

***Andersonaltica neiba* Konstantinov & Linzmeier sp. nov. (Figs. 1–8)**

urn:lsid:zoobank.org:act:1A684C75-638B-4469-861F-F6A9D593BC70

Figure 1. *Andersonaltica neiba*. **1,** dorsal habitus (illustration by Misaki Ouchida - National Museum of Natural History and Systematic Entomology Laboratory scientific illustrator internship program, summer 2016 and Taina Litwak).



Figures 2–4. *Andersonaltica neiba*. **2,** dorsal habitus; **3,** lateral habitus; **4,** habitus three quarter view.

Figures 5–6. *Andersonaltica neiba*. **5,** habitus, frontal view; **6,** median lobe of aedeagus (ventral and lateral views).

Figures 7–8. Sierra de Neiba habitat of *Andersonaltica neiba*.

Description. Body length 1.67–2.10 mm, width 0.97–1.24 mm. Head and pronotum black. Scutellum yellowish to brown. Elytron's background mostly uniformly black while apex lighter in color. Surface with bright purple or blueish tint. Most elytral setae yellow. Bases of pro- and mesofemora, basal antennomeres, all tibiae and apex of metafemora light brown. Bases of metafemora dark brown. Elytron with three bumps: one in middle of basal margin, another smaller one down posteriorly and slightly laterally, and the third one on posterior slope as tall as the first one. Head with vertex lacking longitudinal ridge above antennal calli. Midfrontal sulcus wide, deep, relatively short, widening ventrally as to encircle inner corners on antennal calli, in females wider than in males. Pronotal side nearly straight, pronotum appears to widen anteriorly. Middle of pronotum with two tall elongate elevations separated by shallow, wide impression. Pronotal punctures large, adjacent, present through entire pronotal surface. Hind tibia with transverse ridge above tarsal insertion. Median lobe of aedeagus simple, with shallow, wide impression near apex, gradually narrowing apically, with relatively widely rounded apex in ventral view. In lateral view moderately bent below middle with apex slightly bent ventrally.

Diagnosis. *Andersonaltica neiba* can be easily differentiated from *A. villabarrancoli* based on the following characters: elytron with purple or blueish tint in males and females (elytron black or dark brown with pattern in males and uniformly black in females in *A. villabarrancoli*); yellowish longitudinal ridges at base of elytron missing (present in *A. villabarrancoli*); transverse depression on elytron absent (present in *A. villabarrancoli*); hind tibia with transverse ridge above tarsal insertion (absent in *A. villabarrancoli*); median lobe of aedeagus more or less parallel sided from base, narrowing toward apex, then widening slightly and narrowing again (in *A. villabarrancoli* gradually narrowing towards apex). In addition, males and females are quite similar in *A. neiba* while they differ significantly in *A. villabarrancoli.*

Habitat. Unidentified moss samples which contained *A. neiba* were collected in the forest (Fig. 7, 8) from a variety of substrates (rocks, tree stumps, trunks and branches) in 2006. In addition to *A. neiba*, *Kiskeya neibae* Konstantinov & Chamorro-Lacayo 2006 was found in the same place.

Etymology. This species is named after its type locality. The epithet is a noun in apposition.

Type material examined: Holotype, male: 1) Dominican Republic: Elías Piña., Sierra de Neiba, 1.5 km E of Military Post 204, 12.VII.2006, h-1597m 18°41.644'N, 71°46.457'W leg. A. Konstantinov (USNM). Paratypes 6 females with the same labels as holotype (4 USNM, 2 MHND).

Andersonaltica villabarrancoli Konstantinov & Linzmeier sp. nov. (Figs. 9–29)

urn:lsid:zoobank.org:act:C6836694-5A07-4435-A24F-FC4A2AB35DCF

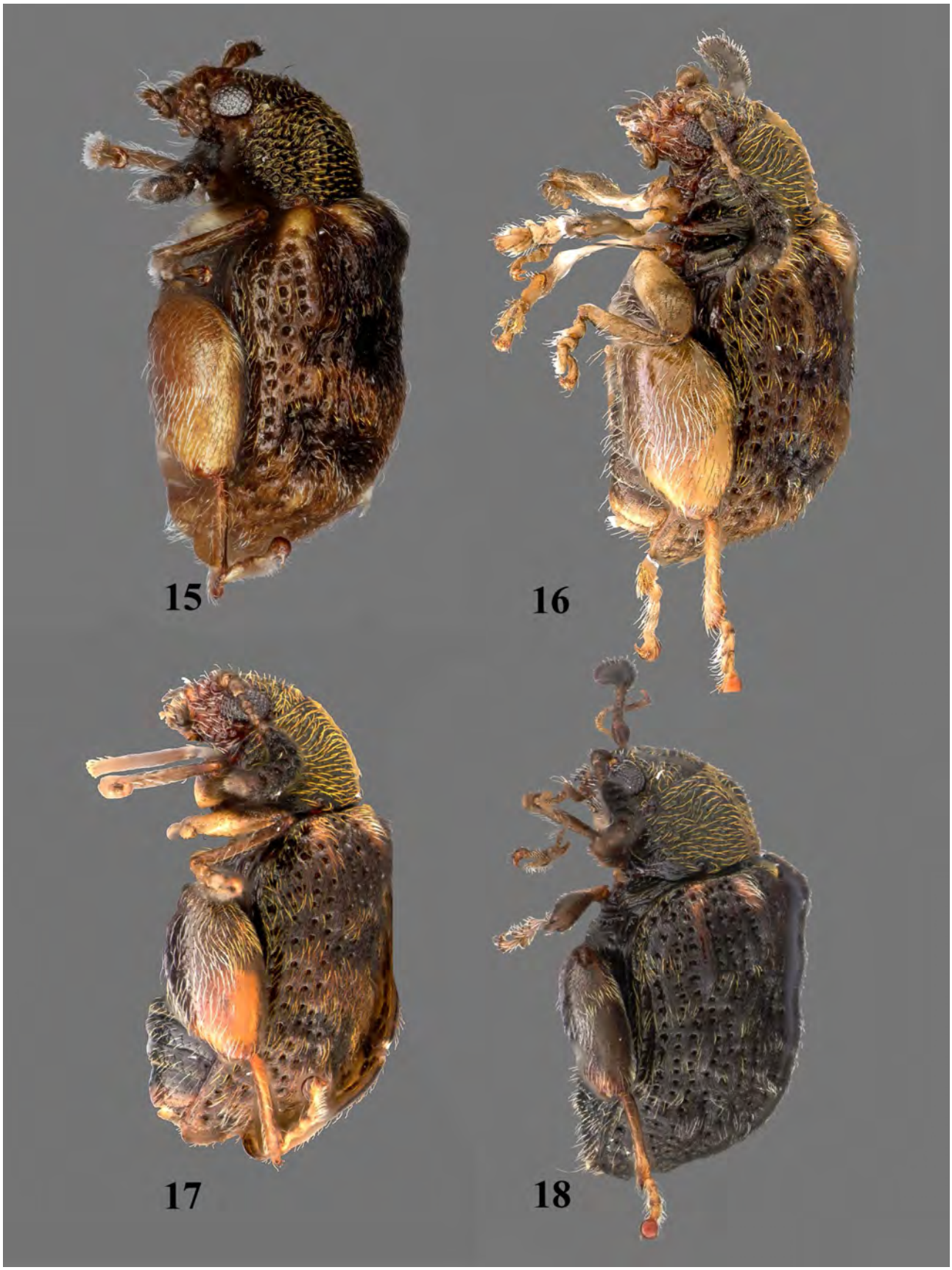
Description. Body length 2.10–2.32 mm, width 1.24–1.45 mm. Vertex black, frons and below, black (female) or dark brown (male). Pronotum black with greenish tint. Elytron in female black with longitudinal ridge at base brown and two ridges on its side slightly darker. Most elytral setae black. Elytron in male dark brown to black with two ridges basally in middle and along humeral callus and two transverse stripes in posterior part of elytron light brown. Legs and antennae in female mostly black to dark brown, in male – bicolorous. Bases of pro- and middle tibiae light brown to yellow. Female elytron with following bumps: near middle; middle to humeral callus; lateral to humeral callus; below closer to suture; two lower, toward elytral apex, and two longitudinal depression, one below middle and another closer of elytral apex. Male elytron with fewer bumps: middle section lighter in color forms transverse elevation with depressions on each side. Head with vertex having longitudinal ridge above antennal calli in males (lacking in females). Midfrontal sulcus, wide, deep, widening ventrally as to encircle inner corners on antennal calli, in females wider than in males. Anterofrontal ridge well developed laterally. Pronotal side nearly straight. Middle of pronotum with two tall, elongate elevations separated by shallow, wide impression. Pronotal punctures large, adjacent, absent along narrow longitudinal stripe in middle, stripe missing in some males and in all females. Hind tibia without transverse ridge above tarsal insertion. Median lobe of aedeagus simple, with shallow, wide impression near apex, gradually narrowing apically, with relatively widely rounded apex in ventral view. In some specimens apex narrower or narrowing more abruptly. In lateral view strongly bent near base with apex slightly bent ventrally and dorsally right at tip.

Diagnosis. *Andersonaltica villabarrancoli* can be easily differentiated from *A. neiba* based on the following characters: elytron black of dark brown with pattern in males and uniformly black in females (in *A. neiba* elytron with purple or blueish tint in males and females); yellowish longitudinal ridges at base of elytron present (missing in *A. neiba*); transverse depression on elytron present (absent in *A. neiba*); hind tibia without transverse ridge above tarsal insertion (in *A. neiba* this ridge is present); median lobe of aedeagus gradually narrowing towards apex (in *A. neiba* more or less parallel sided from base, narrowing toward apex, then widening slightly and narrowing again). In addition, *A. villabarrancoli* is sexually dimorphic, while males and females are similar in *A. neiba.*

Figure 9. *Andersonaltica villabarrancoli*, male (illustration by Emma Howes and Katie Sayers - National Museum of Natural History and Systematic Entomology Laboratory scientific illustrator internship program, summer 2019).

Figure 10. *Andersonaltica villabarrancoli*, female (illustration by Linden Pederson - National Museum of Natural History and Systematic Entomology Laboratory scientific illustrator internship program, summer 2019).

Figures 11–14. *Andersonaltica villabarrancoli*. Dorsal habitus, body color and shape variation. **11–13,** males; **14,** female.



Figures 15–18. *Andersonaltica villabarrancoli*. Lateral habitus, body color and shape variation. **15–17,** males; **18,** female.

Figures 19–22. *Andersonaltica villabarrancoli*. Color and shape variation. **19–20,** habitus, frontal view, males; **21–22,** head, frontal view, females.

Figures 23–25. *Andersonaltica villabarrancoli*. Variation of median lobe of aedeagus (ventral and lateral views).

Figures 26–27. Forest in Zapoten, habitat of *Andersonaltica villabarrancoli* (photography by Rick Stanley and Gabby Salazar, Bethesda, MD).

Figures 28–29. Moss cushions in Zapoten, habitat of *Andersonaltica villabarrancoli*.

Habitat. *Andersonaltica villabarrancoli* was collected in Zapoten forest (northern slopes of Sierra de Baoruco) in moss that was abundant on the sides of the road, tree trunks and branches (Fig. 28, 29). Altogether about 30 gallons of moss was collected in 5 pillowcases. Small portion of it was processed directly with Berlese extraction and the rest was sifted and then processed with Berlese. This moss collecting event revealed one of the largest diversity of flea beetles. In addition to *Andersonaltica villabarrancoli*, it uncovered one species of *Erinaceialtica* and one species of *Kiskeya* Konstantinov and Chamorro-Lacayo 2006.

Etymology. The species epithet is a noun in apposition, derived from Villa Barrancoli, the name of the entry point to Zapoten.

Type material examined: Holotype male: 1) Dominican Republic, Independencia, Sierra de Baoruco, Zapoten, h-1705 m, 15.XII 2014, WP-522, 18°19.655′N, 71°41.994′W, thick moss cushion on rocks, leg. A. Konstantinov (USNM). Paratypes with the same labels as holotype, except 2014.12.15 0637 (6 males, 3 females USNM), (1 male MHND).

Acknowledgments

We thank Linden Pederson, Emma Howes, Katie Sayers, and Misaki Ouchida [National Museum of Natural History and Systematic Entomology Laboratory (SEL) scientific illustrator internship program, summer 2019 and 2016] for rendering the habitus illustrations and Taina Litwak (SEL) for editing digital images and of the habitus illustrations. Jana Maravi (National Museum of Natural History internship program, 2015) took and edited digital images of many specimens described here. Lisa Roberts (SEL) edited other digital images used in this paper. Gino Nearns (APHIS, PPQ) and Mark Volkovitsh (Zoological Institute, St. Petersburg, Russia) reviewed earlier version of this paper and provided valuable suggestions.

We are grateful to Steve Lingafelter (APHIS, PPQ), Gino Nearns, and Norm Woodley (Hereford, AZ) for comradery and companionship during collecting trips to the Dominican Republic. Jane and Rick Stanley and Gabby Salazar provided generous assistance and accommodations in Punta Cana and companionship during collecting trips to Dominican Republic. Rick and Gabby also supplied photographs of the landscape of Zapoten. Kelvin Guerrero, Santo Domingo, Dominican Republic provided in-country consulting and logistical support. We are grateful to Kate Wallace for her hospitality during our stay at Villa Barrancoli, an entry point to Zapoten.

Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA. USDA is an equal opportunity provider and employer.

References

Folmer O., Black M., Hoeh W., Lutz R. & Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* 3(5): 294–299.

Konstantinov A. S. 1998. Revision of the Palearctic species of *Aphthona* Chevrolat and cladistic classification of the Aphthonini (Coleoptera: Chrysomelidae: Alticinae). Memoirs on Entomology, International, Associated Publishers, Gainesville, 429 pp.

Konstantinov A. S. & Chamorro-Lacayo. M. L. 2006. A new genus of moss-inhabiting flea beetles (Coleoptera: Chrysomelidae) from the Dominican Republic. *The Coleopterists Bulletin* 60(4): 275–290.
https://doi.org/10.1649/0010-065X(2006)60[275:ANGOMF]2.0.CO;2

Konstantinov A. S. & Konstantinova A. A. 2011. New genus and species of flea beetles (Coleoptera, Chrysomelidae, Galerucinae, Alticini) from Puerto Rico, with comments on flea beetle diversity in the West Indies and a key to the West Indian Monoplatini genera. *ZooKeys* 155: 61–87.
https://doi.org/10.3897/zookeys.155.2124

Konstantinov A. S. & Linzmeier A. M. (in press). Moss inhabiting flea beetles (Coleoptera: Chrysomelidae: Galerucinae: Alticini) of the West Indies III: *Erinaceialtica*, a new genus from Hispaniola. *ZooKeys*.

Konstantinov A. S., Linzmeier A. M., Scheffer S. J. & Lewis M. L. 2020. Moss-inhabiting flea beetles of the West Indies I: New species of *Borinken* Konstantinov and Konstantinova and *Kiskeya* Konstantinov and Chamorro-Lacayo (Coleoptera: Chrysomelidae: Galerucinae: Alticini) from Puerto Rico. *Insecta Mundi* 0771: 1–12.

Linzmeier A. M. & Konstantinov A. S. 2012. A new genus of leaf litter inhabiting Neotropical Monoplatina (Coleoptera: Chrysomelidae: Galerucinae: Alticini). *Zootaxa* 3260: 19–32.
https://doi.org/10.11646/zootaxa.3260.1.2