Fragmenta entomologica, 48 (2): 143-151 (2016)

eISSN: 2284-4880 (online version)
pISSN: 0429-288X (print version)

Research article
Submitted: November 4th, 2016 - *Accepted*: December 7th, 2016 - *Published*: December 31st, 2016

Revision of *Diphaulacosoma* Jacoby, an endemic flea beetle genus from Madagascar, with description of three new species (Coleoptera: Chrysomelidae, Galerucinae, Alticini)

Maurizio BIONDI [1,*], Paola D'ALESSANDRO [1]

[1] *University of L'Aquila, Department of Life, Health and Environmental Sciences, Section of Environmental Sciences - Via Vetoio 12, 67100 L'Aquila, Italy* - maurizio.biondi@univaq.it, paola.dalessandro@univaq.it
* Corresponding author
urn:lsid:zoobank.org:pub:41408F67-48F4-41B1-A6E7-9776C74AF1A6

Abstract
A taxonomic revision of the flea beetle genus *Diphaulacosoma* Jacoby, endemic to Madagascar, is provided. This genus includes seven species of which three are new to science: *D. elegans* sp. n., *D. jenisi* sp. n., and *D. nigroscutis* sp. n. An updated catalogue including new material, new faunistic records, distributions, chorotypes, and ecological notes is supplied. Lectotypes for *Diphaulacosoma laevipenne* Jacoby, *D. bicolor* (Weise) and *D. scutellare* (Weise) are designated. Additionally, the revision comprises a key for the identification of all seven species considered, habitus photos, and microscope and scanning electron micrographs of diagnostic characters, including aedeagus and spermatheca.

Key words: *Diphaulacosoma*, new species, Coleoptera, Chrysomelidae, Alticini, Madagascar.

Introduction

The flea beetle genus *Diphaulacosoma* was described by Jacoby in 1892 on the basis of two specimens generically labelled "Madagascar" and attributed to the new species *laevipenne*. After more than seventy years, Bechyné (1964) supplied a precise locality reporting this species for Diégo-Suarez (now Antsiranana), locality placed in Northern Madagascar. Previously in 1952, still Bechyné described the new subgenus *Neoderina* inside the genus *Neodera* Duvivier, 1891; this subgenus was recently synonymized with *Diphaulacosoma* by Biondi & D'Alessandro (2012), which also attributed to this genus further two Malagasy species, *Diphaulacosoma scutellare* (Weise, 1910a) and *D. bicolor* (Weise, 1910a), both described originally in the genus *Phygasia* Chevrolat, 1836 (Biondi & D'Alessandro 2013).

In this contribution, we report the taxonomic revision of this interesting flea beetle genus, endemic to Madagascar, with the descriptions of three species new to science. In addition, a key for the identification of the known seven species, and an updated catalogue including new material, new faunistic records, distributions and chorotypes, are also provided.

Material and methods

The material examined consisted of dried pinned specimens deposited at: BMNH: The Natural History Museum, formerly British Museum (Natural History), London, Great Britain; MHNG: Muséum d'Histoire Naturelle, Geneva, Switzerland; MNHN: Muséum National d'Histoire Naturelle, Paris, France; MSNG: Museo Civico di Storia Naturale di Genova, Genova, Italy; NHMB: Naturisches Museum, Basel, Switzerland; NMPC: Entomologické oddělení Národního muzea, Praha-Kunratice, Czech Republic; RMCA: Musée Royal de l'Afrique Centrale, Tervuren, Belgium; ZMHB: Zoologisches Museum der Humboldt Universität, currently Museum für Naturkunde der Humboldt-Universität zu Berlin, Berlin, Germany. These internationally recognized codens follow the list on 'The Insect and Spider Collections of the World Website' (Evenhuis 2016).

Specimens were examined, measured and dissected using a LEICA M205C binocular microscope. Photomicrographs were taken using a Leica DFC500 camera and processed using Zerene Stacker version 1.04 software. Scanning electron micrographs were taken using a HITACHI TM-1000. Geographical coordinates of the localities are reported in degrees, minutes and seconds (DMS-WGS84 format); coordinates and geographical information included in square brackets were added by the authors and follow those available from web sources; chorotypes proposed are referred to Biondi & D'Alessandro (2006). The terminology used for the spermatheca follows Döberl (1986), Furth & Suzuki (1994) and Suzuki (1988); for the metafemoral

spring follows Furth & Suzuki (1998); for the median lobe of aedeagus follows D'Alessandro et al. (2016).

Measurements

LA	numerical sequence proportional to length of each antennomere
LAED	length of aedeagus
LAN	length of antennae
LB	total length of body
LE	length of elytra
LP	length of pronotum
LSP	length of spermathecal
WE	width of elytra
WP	width of pronotum

Taxonomy

***Diphaulacosoma* Jacoby**

Diphaulacosoma Jacoby 1892: 574; Bechyné, 1952: 251; Biondi & D'Alessandro, 2010: 406; 2012: 43.
= *Neoderina* Bechyné, 1952 (subgenus of *Neodera* Duvivier, 1891) synonymized by Biondi & D'Alessandro (2012).

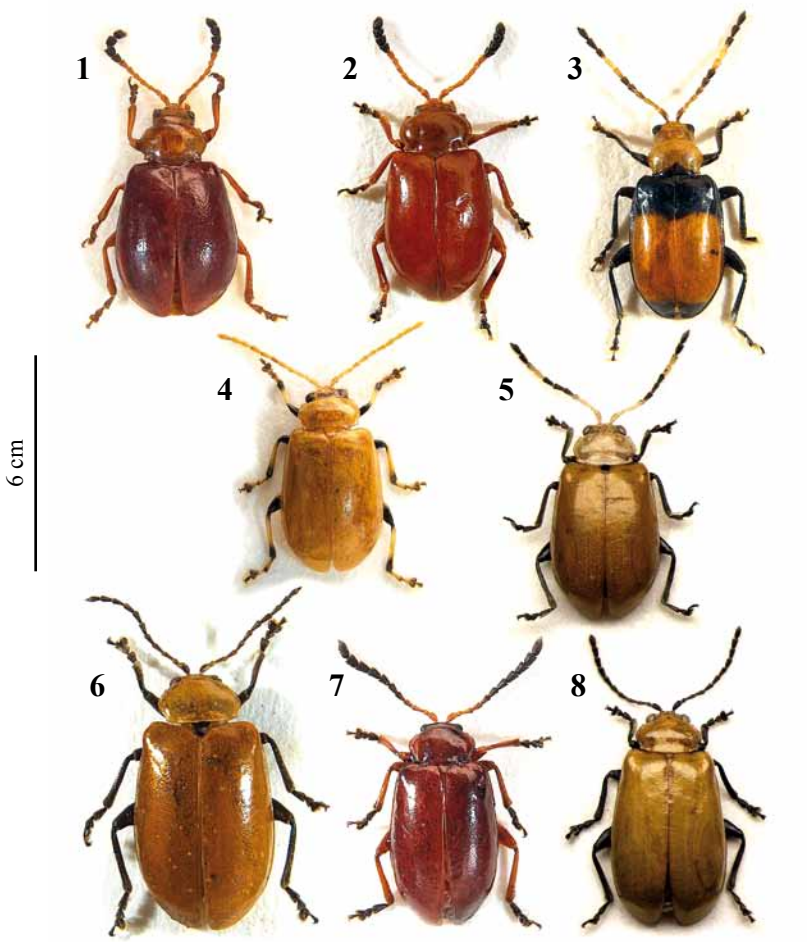
Distribution. Madagascar.

Type species. *Diphaulacosoma laevipenne* Jacoby, 1892, designation by monotypy.

Redescription of the genus. Based on the new examined material, an updated short redescription of the genus is here reported. Body oval-elongate, moderately convex (Figs 1-8). Head (Fig. 9) apparently impunctate; frontal grooves clearly impressed; frontal tubercles clearly distinguishable, laterally not clearly delimited; third and fourth segments of maxillary palpi clearly enlarged (Fig. 10); eyes rather small, sub-rounded (Fig. 9); antennomere 3 about twice as long as antennomere 2 (Fig. 9). Pronotum (Fig. 11) apparently impunctate; laterally very strongly arcuate and narrowly bordered, with distinctly prominent, dentiform posterior angles; pronotal antebasal depression laterally touching basal margin; pronotal base clearly narrower than elytral base. Procoxal cavities posteriorly open (Fig. 10). Elytral punctation entirely confuse, formed by very small and dense punctures, often almost indistinguishable; elytral border visible in dorsal view. Metafemoral spring (Fig. 12) with slightly curved dorsal lobe, particularly in middle part, and strongly elongate extended arm; basal edge of spring weakly curved, forming an obtuse angle (dorsal-basal angle) with dorsal margin of dorsal lobe; dorsal margin of ventral lobe straight, moderately angled down; basal angle of ventral lobe sub-rounded; recurved flange clearly developed. This metafemoral spring can be attributed to the *Altica* morpho-group of Furth & Suzuki (1998). Spermatheca (Figs 18-23) with sub-cylindrical basal part; distal part curved, with collum and apical part not distinguished; ductus sub-apically inserted, moderately elongate, uncoiled. Aedeagus (Figs 13-17) more variable than spermatheca, with phallobase narrower than median lobe; dorsal ligula short and wide.

Taxonomic notes. Among the Malagasy flea beetle genera, *Diphaulacosoma* shows a general similarity with *Neodera* Duvivier, 1891 and *Pseudophygasia* Biondi & D'Alessandro, 2013. It can be easily distinguished from *Neodera* mainly by the open procoxal cavities (closed in *Neodera*) and the pronotal shape and sculpture. Pronotum in *Diphaulacosoma* is characterized by: very strongly arcuate sides (weakly arcuate in *Neodera*); posterior angles distinctly produced (not distinctly produced in *Neodera*); pronotal antebasal transverse sulcus weakly depressed (deeply impressed in *Neodera*); pronotal surface smooth without any larger punctures laterally grouped (punctures present in *Neodera*) (D'Alessandro et al. 2014). Further differences useful to separate these two genera are also the maxillary palpi distinctly enlarged in *Diphaulacosoma* but not in *Neodera*, and the third tarsomere medially weakly incised in *Diphaulacosoma*, clearly incised in *Neodera*. Also the genus *Pseudophygasia* can be easily distinguishable for having, as well as the pronotum less arcuate laterally, posterior angles not distinctly produced and pronotal antebasal transverse sulcus deeply impressed, also the antennomere 3 as long as the antennomere 2 or slightly longer (distinctly longer in *Diphaulacosoma*), and the elytral punctation arranged in regular rows, even though sometimes just visible among the punctulate interstriae (elytral punctation entirely confuse in *Diphaulacosoma*) (Biondi & D'Alessandro 2013). Out of Madagascar, two other genera show similarities with *Diphaulacosoma*: *Phygasia* Chevrolat, 1836, widespread in the Afrotropical (excluding Madagascar), Oriental, and Palaearctic regions, and *Eurylegna* Weise, 1910b, occurring in the central and eastern areas of the Afrotropical region (Biondi & D'Alessandro 2012). *Phygasia*, even if rather variable in morphology, is mainly distinguishable by the differently shaped pronotum, laterally not strongly arcuate, with posterior angles apically not distinctly produced, and the pronotal transverse antebasal sulcus distinctly impressed. *Eurylegna*, instead, shares with *Diphaulacosoma*: the pronotum with very weakly or indistinctly impressed antebasal transverse sulcus; third and fourth segments of maxillary palpi clearly enlarged; elytral punctation entirely confused. However, *Eurylegna* can be easily recognized for having the pronotum more weakly rounded and slightly narrower basally; in addition, in this genus the posterior angles are laterally very indistinctly produced and apically finely dentiform (Biondi & D'Alessandro 2012).

Ecological notes. No host plants or auto-ecological data information is available for *Diphaulacosoma*. However, on the basis of their distribution they are likely associated with the Forest Formations of the northern and east-

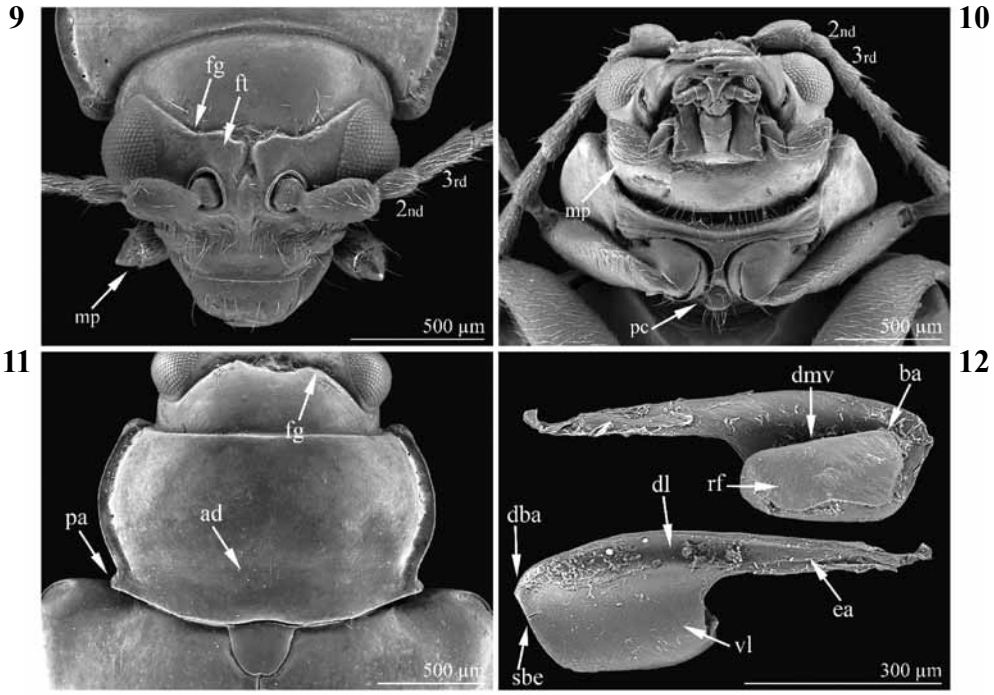


Figs 1-8 – Habitus in dorsal view of *Diphaulacosoma* spp.: **1**, *Diphaulacosoma laevipenne* Jacoby ♂; **2**, ditto ♀; **3**, *D. elegans* sp. n. ♂; **4**, *D. jenisi* sp. n. ♀; **5**, *D. scutellare* (Weise) ♀; **6**, *D. nigroscutis* sp. n. ♀; **7**, *D. crassicornis* (Bechyné) ♂; **8**, *D. bicolor* (Weise) ♀.

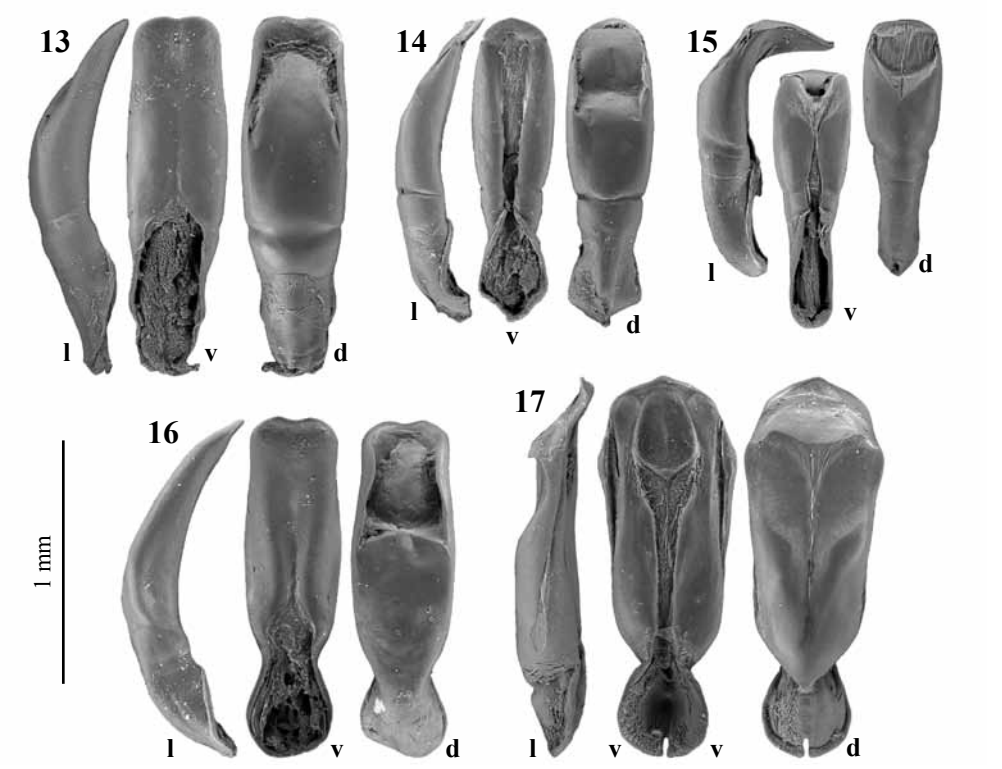
ern parts of Madagascar, mainly Tropical Lowland Humid Forest and Tropical Seasonality Dry Forest (Figs 24-25).

Key to species

1. Antennae filiform with last antennomeres as thin as proximal ones (Figs 3-6, 8) 2
- Antennae with last antennomeres clearly thickset compared to proximal ones (Figs 1-2, 7) 6
2. Scutellum black (Figs 3, 5-6) 3
- Scutellum yellow or reddish (Figs 1-2, 4, 7-8) 5
3. Antennae evenly blackish; sometimes first antennomeres slightly paler. Spermatheca with thin basal part and short distal part (Fig. 21). Larger size, at least in female (LB ≥ 6.50 mm). Male unknown ..... ***Diphaulacosoma nigroscutis* sp. n.** (Fig. 6)
- Antennae with groups of antennomeres alternately black and yellow (Figs 3, 5). Spermatheca with generally more thickset basal part and slightly longer distal part (Figs 18-20, 22-23). Smaller size (LB < 6.50 mm) 4
4. Dorsum black and yellow. Elytral margin wider, clearly visible in dorsal view. Median lobe of aedeagus rhomboid-shaped in ventral view, with a complete ventral sulcus and two thinner lateral sulci. Spermatheca with strongly curved distal part (Fig. 22) ..... ***D. elegans* sp. n.** (Fig. 3)
- Dorsum evenly yellow with only scutellum black. Elytral margin thin. Median lobe of aedeagus with apical fourth 90° bent ventrally; in ventral view, aedeagus with a complete ventral sulcus gradually closed towards apical part (Fig. 15). Spermatheca with less curved distal part (Fig. 18) ..... ***D. scutellare* (Weise, 1910)** (Fig. 5)
5. Antennae yellow. Legs with articulations distinctly blackened. Spermatheca with straight basal part and slightly shorter distal part (Fig. 23). Male unknown ..... ***D. jenisi* sp. n.** (Fig. 4)
- Antennae and legs evenly black. Spermatheca with slightly bent basal part (Fig. 19). Median lobe of aedeagus apically sub-rounded, with complete ventral sulcus; in lateral view, aedeagus slightly and regularly curved (Fig. 14) ..... ***D. bicolor* (Weise, 1910)** (Fig. 8)
6. Antennomeres gradually thickset towards antennal apex; antennomeres 2-4 reddish, 5-11 black. Dorsum reddish. Aedeagus with basal part curved in lateral view and clearly separated from median lobe (Fig. 16). Female unknown ..... ***D. crassicornis* (Bechyné, 1952)** (Fig. 7)
- Antennomeres 1-7 thin and reddish, 8-11 thickset and black. Dorsum dark yellow, reddish or bicolored (with yellow pronotum and reddish elytra). Aedeagus with basal part straight in lateral view and less separated from median lobe (Fig. 13). Spermatheca with elongate distal part and thickset ductus (Fig. 20) ..... ***D. laevipenne* Jacoby, 1892** (Figs 1-2)



Figs 9-12 – Morphological features of *Diphaulacosoma* spp.: **9**, *D. scutellare* (Weise), head; **10**, ditto, mouthparts and prosternum; **11**, ditto, pronotum; **12**, metafemoral spring of *D. laevipenne* Jacoby, both sides of lateral view. Abbreviations in Figs 9-11: 2nd= second antennomere; 3rd= third antennomere. ad = antebasal depression; fg = frontal grooves; ft = frontal tubercles; mp = maxillay palpi; pa = posterior angles; pc = procoxal cavity. Abbreviations in Fig. 12: ba = basal angle of ventral lobe of the metafemoral spring; dba = dorsal-basal angle; dl = dorsal lobe; dmv = dorsal margin of ventral lobe; ea = extended arm of dorsal lobe; rf = recurve flange; sbe = spring basal edge; vl = ventral lobe.



Figs 13-17 – Male genitalia of *Diphaulacosoma* spp.: **13**, *Diphaulacosoma laevipenne* Jacoby; **14**, *D. bicolor* (Weise); **15**, *D. scutellare* (Weise); **16**, *D. crassicornis* (Bechyné); **17**, *D. elegans* sp. n. Abbreviations: d = dorsal view; l = lateral view; v = ventral view.

***Diphaulacosoma bicolor* (Weise, 1910)**
Phygasia bicolor Weise 1910a: 468
Diphaulacosoma bicolor (Weise 1910a): Biondi & D'Alessandro 2013: 103

Material examined. **Madagascar**: Lectotype ♂ (here designated) "Amber-Gebirge, Nd. Madagascar, H. Rolle, Berlin, SW11" (ZMHB). Paralectotypes: same data of lectotype, 1 ♀ (ZMHB). Madagascar, Mont d'Ambre, [12°37′0″S 49°08′59″E], Coll. Clavareau, 2 specimens (RMCA); Madagascar, Antsiranana prov., Ambohitra [12°29′37″S 49°12′20″E], 30 Nov-2 Dec 1996, I. Jeniš leg., 5 specimens (MHNG); Madagascar Est, Marojejy-Ouest, [14°26′29″S 49°44′21″E], 1600m, Oct 1959, P. Soga leg., 1 specimen (MNHN); Madagascar, Tamatave prov., Andasibe (Maromizaha), [18°58′25″S 48°27′53″E), 21-24 Nov 1995, I. Jeniš leg., 1 specimen (MHNG); Madagascar, Tamatave prov., Moramanga 13, 5 km S, [19°04′19″S 48°13′45″E], 18 Dec1957, F. Keiser leg., 1 specimen (MNHN); Madagascar, mars, collection Le Moult, 1 specimen (MNHN).

Distribution. Eastern Madagascar (Fig. 24). Chorotype: Malagasy (MAL).

Ecological notes. No host plants or auto-ecological data information is available for this species.

***Diphaulacosoma crassicornis* (Bechyné, 1952)**
Neodera (Neoderina) crassicornis Bechyné 1952: 251
Diphaulacosoma crassicornis (Bechyné, 1952): Biondi & D'Alessandro 2012: 43; D'Alessandro et al. 2014: 711

Material examined. **Madagascar**: Holotype ♂ "Ambohitsitondrona [= Ambohitsitondroina, 15°34′59″S 50°0′59″E], xii.1947, M. Michel leg.", type of *Neodera* (*Neoderina*) *crassicornis* Bechyné (MNHN). Paratypes: ditto, 900 m, x.1947, M. Michel leg., cotype ♂ of *Neodera* (*Neoderina*) *crassicornis* Bechyné (MNHN).

Distribution. Northern-Eastern Madagascar (Fig. 24). Chorotype: Malagasy (MAL).

Ecological notes. No host plants or auto-ecological data information is available for this species.

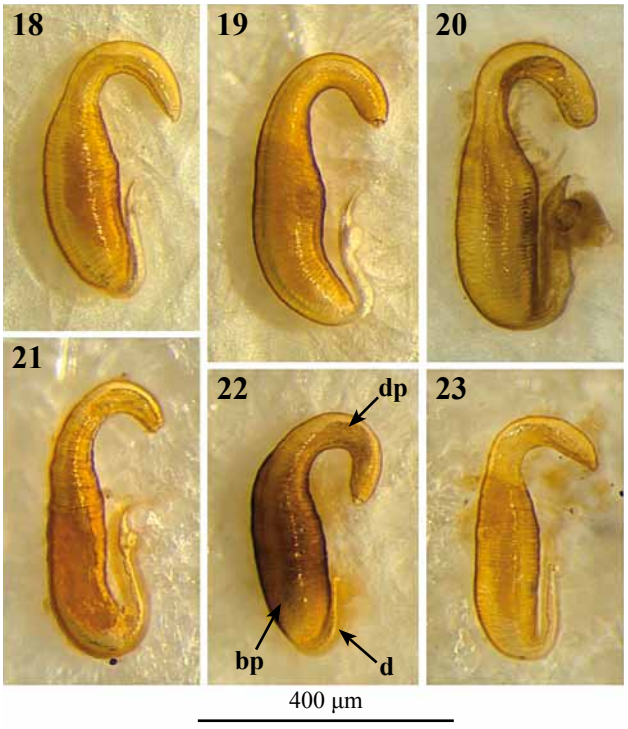
***Diphaulacosoma elegans* sp. n.**
urn:lsid:zoobank.org:act:9B58208B-D234-4236-8849-6E2F430EDAE9
Type material. **Madagascar**: Holotype ♂ "Madagascar est, massif du Marojejy (Res. Nat. Intégr. 12) [14°26′29″S 9°44′21″E], 1300m, 2-8 Dec 1972, Madagascar Centre Mission C.N.R.S.- R.C.P., A. Peyrieras leg." (MNHN). Paratypes: same data of the holotype, 1 ♀ (MNHN).

Diagnosis. *Diphaulacosoma elegans* sp. n. is easily distinguishable from the congeneric species by the singular color of dorsal integuments (Fig. 3). The aedeagus is also clearly recognizable by the unique rhomboid shape (Fig. 17).

Description of the holotype ♂. Body oval-elongate, moderately convex (Fig. 3) (LB = 5.20 mm); maximum pronotal width at apical third (WP = 1.45 mm); maximum elytral width a little behind the middle (WE = 2.50 mm); pronotal base clearly narrower than elytral base. Dorsum with head and distal part of pronotum pale; pronotal base black; elytra black in basal and apical part, yellow in middle part. Head impunctate; frontal grooves very deeply impressed anteriorly, clearly visible around ocular margin; frontal tubercles not prominent, medially juxtaposed, posteriorly delimited by frontal grooves, laterally not delimited; frontal carina absent, but interantennal space as a whole distinctly raised; antennae slightly longer than half body length (LAN = 3.45 mm; LAN/LB = 0.66), with antennomeres 1-6 and 9-11 mostly darkened, and 7-8 pale; LA: 100 : 40 : 80 : 77 : 80 : 80 : 90 : 93 : 97 : 97: 117; eyes sub-rounded, rather small; mouthparts darkened, maxillary palpi clearly enlarged. Pronotum slightly trapezoidal, posteriorly narrower, distinctly transverse (LP = 0.95 mm; WP/LP = 1.53), laterally strongly curved; anterior and posterior angles apically dentiform, clearly prominent; antebasal depression laterally touching basal margin; pronotal punctation indistinguishable. Elytra elongate (LE = 3.85 mm; WE/LE = 0.65), laterally weakly arcuate; elytral border clearly visible in dorsal view; punctation entirely confused, almost indistinguishable. Metathoracic wings macropterous. Legs evenly black; first pro- and mesotarsomeres weakly dilated; adhesive setae on ventral side of first pro-, meso-, and mesotarsomeres. Ventral parts black, with the exception of the anterior part of prosternum, pale. Aedeagus (Fig. 17) (LAED = 1.60 mm; LE/LAED = 2.41), with median lobe clearly distinct from base; in ventral view thickset, rhomboid-shaped, wider in apical part, with two lateral grooves; complete ventral sulcus complete; apical part with an oval depression; in lateral view, aedeagus straight, with apical part ventrally bent.

Variation. Paratype (female) very similar in shape, sculpture, and color to the holotype. First metatarsomeres not dilated and lacking of adhesive setae on ventral side; more transverse pronotum and shorter antennae. Spermatheca (Fig. 22) with sub-cylindrical basal part; distal part elongate, strongly curved, thinner but finely distinct from basal part; ductus short, thin, sub-apically inserted.
Female (n = 1): LE = 4.50 mm; WE = 3.10 mm; LP = 1.08 mm; WP = 1.85 mm; LAN = 3.10 mm; LSP = 0.35 mm; LB = 5.60 mm; LE/LP = 4.19; WE/WP = 1.68; WP/LP = 1.72; WE/LE = 0.69; LAN/LB = 0.55; LE/LSP = 12.89.

Distribution. Northern-Eastern Madagascar (Fig. 25). Chorotype: Malagasy (MAL).



Figs 18-23 – Spermatheca of *Diphaulacosoma* spp.: **18**, *Diphaulacosoma scutellare* (Weise); **19**, *D. bicolor* (Weise); **20**, *D. laevipenne* Jacoby; **21**, *D. nigroscutis* sp. n.; **22**, *D. elegans* sp. n.; **23**, *D. jenisi* sp. n. Abbreviations: bp = basal part; d = ductus; dp = distal part.

Specific epithet. The specific epithet refers to the "elegant" color of the dorsal integuments of this new species.

Ecological notes. No host plants or auto-ecological data information is available for this species.

Diphaulacosoma jenisi sp. n.

urn:lsid:zoobank.org:act:C48C61BD-DC83-42D8-88E6-2D2EE1507A90

Type material. **Madagascar**: Holotype ♀ "Antananarivo prov. Manankazo env, [17°59′13″S 46°54′06″E], 9-12 Dec 1995, I. Jeniš leg." (MHNG). Paratypes: same data of the holotype, 1 ♀ (MHNG); Madagascar, Tamatave prov., Moramanga env., [18°57′08″S 48°13′15″E], 14-18 Dec 1995, I. Jeniš leg., 1 ♀ (MHNG); Madagascar, Tamatave prov., Moramanga 13, 5 km S, [19°04′19″S 8°13′45″E], 18 Dec 1957, F. Keiser leg., 2 ♀♀ (NHMB).

Diagnosis. *Diphaulacosoma jenisi* sp. n. is similar in shape and size to *D. scutellare* (Figs 4-5). However, it is easily distinguishable for having evenly pale antennae and color of legs - unique among the known *Diphaulacosoma* species - black only in correspondence of the areas of the femoral-tibial and tibial-tarsal articulations. Other differential characters are listed in the key to species above reported.

Description of the holotype ♀. Body oval-elongate, moderately convex (Fig. 4) (LB = 4.90 mm); maximum pronotal width in middle (WP = 1.60 mm); maximum elytral width at apical third (WE = 2.75 mm); pronotal base clearly narrower than elytral base. Dorsal integuments pale; head partially darkened. Head impunctate; frontal grooves clearly impressed up to ocular margin; frontal tubercles weakly raised, medially juxtaposed, posteriorly delimited by the frontal grooves, laterally weakly delimited; frontal carina thin, weakly raised; antennae slightly longer than half body length (LAN = 3.20 mm; LAN/LB = 0.65), pale but with weakly darkened antennomeres 4-11; LA: 100 : 40 : 87 : 93 : 107 : 93 : 107: 100 : 100 : 100: 127; eyes sub-rounded, rather small; mouthparts with black mandible, and maxillary palpi partially darkened and clearly enlarged.

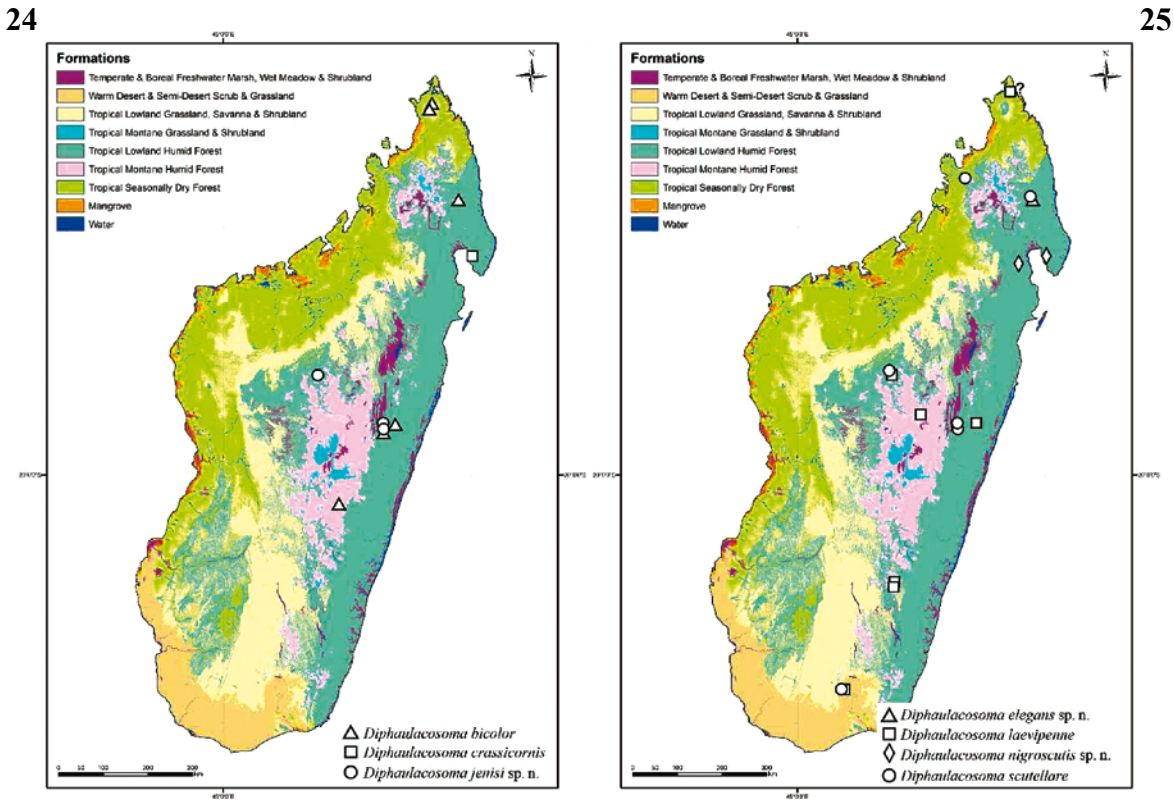
Pronotum sub-rectangular, clearly transverse (LP = 0.95 mm; WP/LP = 1.68), laterally strongly curved; posterior angles dentiform, anterior angles weakly prominent; antebasal depression laterally touching basal margin; pronotal punctation indistinguishable (cfr. Fig. 11). Elytra elongate (LE = 4.00 mm; WE/LE = 0.69), laterally weakly arcuate; elytral border thin but visible in dorsal view; punctation entirely confused formed by very small, almost indistinguishable, punctures. Metatoracic wings macropterous. Legs blackened in correspondence of the femoral-tibial and tibial-tarsal articolations (Fig. 4). Ventral parts pale. Spermatheca (Fig. 23) (LSP = 0.40 mm; LE/LSP = 10.00) with sub-cylindrical and elongate basal part; distal part short and curved; ductus thin, moderately elongate, sub-apically inserted.

Variation. Paratypes (females) very similar in shape, sculpture, and color to the holotype. Male unknown. Female (n = 5; mean and standard deviation; range): LE = 3.86 ± 0.16 mm (3.60 ≤ LE ≤ 4.00 mm); WE = 2.59 ± 0.13 mm (2.40 ≤ WE ≤ 2.75 mm); LP = 0.91 ± 0.05 mm (0.83 ≤ LP ≤ 0.95 mm); WP = 1.60 ± 0.08 mm (1.50 ≤ WP ≤ 1.70 mm); LAN = 2.94 ± 0.19 mm (2.70 ≤ LAN ≤ 3.20 mm); LSP = 0.35 ± 0.04 mm (0.30 ≤ LSP ≤ 0.40 mm); LB = 4.72 ± 0.24 mm (4.35 ≤ LB ≤ 4.95 mm); LE/LP = 4.25 ± 0.12 (4.05 ≤ LE/LP ≤ 4.36); WE/WP = 1.62 ± 0.07 (1.53 ≤ WE/WP ≤ 1.72); WP/LP = 1.75 ± 0.07 (1.68 ≤ WP/LP ≤ 1.84); WE/LE = 0.67 ± 0.02 (0.65 ≤ WE/LE ≤ 0.69); LAN/LB = 0.62 ± 0.02 (0.60 ≤ LAN/LB ≤ 0.65); LE/LSP = 11.28 ± 1.16 (10.00 ≤ LE/LSP ≤ 13.17).

Distribution. Central Madagascar (Fig. 24). Chorotype: Malagasy (MAL).

Specific epithet. The specific epithet is after one of its collectors Ivo Jeniš (Prague, Czech Republic), appreciated specialist of Cerambycidae.

Ecological notes. No host plants or auto-ecological data information is available for this species.



Figs 24-25 – Species distribution: **24**, *Diphaulacosoma bicolor* (Weise), *D. crassicornis* (Bechyné), *D. jenisi* sp. n.; **25**, *D. elegans* sp. n., *D. laevipenne* Jacoby, *D. nigroscutis* sp. n., *D. scutellare* (Weise).

***Diphaulacosoma laevipenne* Jacoby, 1892**

Diphaulacosoma laevipenne Jacoby 1892: 574-575; Bechyné 1964: 161

Material examined. **Madagascar**: Lectotype ♀ (here designated), "Madagascar, Sikura", Jacoby Coll. 1909-28a (BMNH). Madagascar, Tamatave prov., Andasibe (Maromizaha), [18°56′60″S 48°36′0″E], 19-20 Dec 1996, I. Jeniš leg., 4 specimens (MHNG); Madagascar, Antananarivo prov., Manankazo env. [17°59′13″S 46°54′06″E], 11-12 Nov 1995, I. Jeniš leg., 1 specimen (MHNG); ditto, 9-12 Nov 1995, 2 specimens (MHNG); ditto, 15-17 Dec 1996, 1 specimen (MHNG); Madagascar, Réserve naturelle Andranomalaza Vallée d'Ivelona, [Andranomalaza, 18°47′04″S 47°29′10″E], x.1957, P. Soga leg., 1 specimen (MNHN); Madagascar, Andringitra Est, Anjavidilava [22°09′30″S 46°57′08″E 22.15831], 1850-1950 m, 18 Dec 1970/15 Jan 1971, FDHM2, Madagascar Centre Mission C.N.R.S.- R.C.P., 3 specimens (MNHN); Madagascar, Andringitra Sud, Andrianony, cirque Manjarivolo [22°15′41″S 46°55′58″E], 1650 m, 26 Oct/3 nov 1970, FDHM1, Madagascar Centre Mission C.N.R.S.- R.C.P. n.225, 4 specimens (MNHN); Madagascar centre, canton Tsafaridy, forêt d'Amboasary [Amboasary, 24°19′60″S 45°57′0″E], Jan 1961, P. Grivèaud leg., 1 specimen (MNHN).

Distribution. On the basis of the material examined, *D. laevipenne* would seem to be present only in the southern-eastern part of Madagascar (Fig. 25). Bechyné (1964) reports this species also for Diégo-Suarez (now Antsiranana), locality placed in the north of Madagascar. Unfortunately, we cannot confirm this record because we were not able to find the material studied by the Czech entomologist, that should be preserved at the MNHN. Chorotype: Malagasy (MAL).

Ecological notes. No host plants or auto-ecological data information is available for this species.

***Diphaulacosoma nigroscutis* sp. n.**

urn:lsid:zoobank.org:act:39F59E65-9E94-49DF-98C4-3B3DFE405BD5

Type material. **Madagascar**: Holotype ♀ "Beanana [15°44′05″S 49°27′21″E], Oct 1945, M. Michel leg." (NMPC). Paratypes: **Madagascar**: Ambohitsitondrona [= Ambohitsitondroina, 15°34′59″S 50°0′59″E], Jan 1946, J. Vadon, 1 ♀ (NMPC); ditto, Feb 1946, 1 ♀ (NMPC); ditto, Feb 1947, M. Michel leg., 2 ♀♀ (NMPC); ditto, Oct 1947, 1 ♀ (NMPC).

Diagnosis. This species is similar in color pattern to *D. scutellare* and *D. bicolor*. However, differently from *D. scu-*

tellare, its antennae are evenly blackened (Figs 5-6), and differently from *D. bicolor*, its scutellum is black (Figs 6, 8). In addition, *D. nigroscutis* sp. n. is distinctly larger than every other known *Diphaulacosoma* species. Other differential characters are listed in the key to species above reported.

Description of the holotype ♀. Body oval-elongate, moderately convex (Fig. 6) (LB = 7.47 mm); maximum pronotal width in middle (WP = 2.50 mm); maximum elytral width a little behind middle (WE = 4.19 mm); pronotal base clearly narrower than elytral base. Dorsal integuments brownish, with paler pronotum and black scutellum. Head impunctate; frontal grooves clearly impressed up to ocular margin; frontal tubercles slightly raised, medially juxtaposed, posteriorly delimited by frontal grooves, laterally not clearly delimited; frontal carina thin, not prominent; antennae about as long as half body length (LAN = 4.00 mm; LAN/LB = 0.52), with antennomeres mostly darkened; LA: 100 : 45 : 95 : 95 : 90 : 93 : 95 : 95 : 95 : 125; eyes sub-rounded, rather small; mouthparts darkened, maxillary palpi clearly enlarged. Pronotum sub-rectangular, clearly transverse (LP = 1.44 mm; WP/LP = 1.74), laterally strongly curved; anterior and posterior angles dentiform; antebasal depression laterally touching basal margin; pronotal punctation indistinguishable. Elytra elongate (LE = 6.38 mm; WE/LE = 0.66), laterally moderately arcuate; elytral border thin but visible in dorsal view; elytral punctation finely and densely impressed, entirely confused. Metatoracic wings macropterous. Legs entirely black. Ventral parts black, with pale prosternum. Spermatheca (Fig. 21) (LSP = 0.41 mm; LE/LSP = 15.69) with sub-cylindrical and elongate basal part, basally slightly bent, gradually thinner towards distal part; distal part short, curved; ductus thin, moderately elongate, sub-apically inserted.

Variation. Paratypes (females) very similar in shape, sculpture, and color to the holotype; in some specimens pronotum colored like the elytra. Male unknown.
Female (n = 6; mean and standard deviation; range): LE = 6.18 ± 0.46 mm (5.34 ≤ LE ≤ 6.56 mm); WE = 4.26 ± 0.35 mm (3.63 ≤ WE ≤ 4.63 mm); LP = 1.43 ± 0.10 mm (1.25 ≤ LP ≤ 1.56 mm); WP = 2.47 ± 0.20 mm (2.13 ≤ WP ≤ 2.72 mm); LAN = 4.02 ± 0.28 mm (3.75 ≤ LAN ≤ 4.31 mm); LSP = 0.39 ± 0.04 mm (0.31 ≤ LSPc ≤ 0.44 mm); LB = 7.47 ± 0.53 mm (6.50 ≤ LB ≤ 8.06 mm); LE/LP = 4.33 ± 0.14 (4.20 ≤ LE/LP ≤ 4.57); WE/WP = 1.72 ± 0.04 (1.68 ≤ WE/WP ≤ 1.79); WP/LP = 1.73 ± 0.03 (1.70 ≤ WP/LP ≤ 1.78); WE/LE = 0.69 ± 0.03 (0.66 ≤ WE/LE ≤ 0.74); LAN/LB = 0.52 ± 0.02 (0.50 ≤ LAN/LB ≤ 0.53); LE/LSP = 15.88 ± 0.85 (14.92 ≤ LE/LSP ≤ 17.10).

Distribution. Northern-Eastern Madagascar (Fig. 25). Chorotype: Malagasy (MAL).

Specific epithet. The specific epithet is a latinized adjective referring to the black color of the scutellum.

Ecological notes. No host plants or auto-ecological data information is available for this species.

***Diphaulacosoma scutellare* (Weise 1910)**
Phygasia scutellaris Weise 1910a: 469
Diphaulacosoma scutellare (Weise, 1910): Biondi & D'Alessandro 2013: 103

Material examined. **Madagascar**: Lectotype ♀ (here designated) "Andrangaloaka" [Madagascar] (ZMHB). **Madagascar**: Sambirano, Analalava district, poste Maromandia, Manongarivo [Manongarivo, 14°0′43″S 48°22′47″E], 1150m, Dec 1960, R. Andrja leg., 1 specimen (MNHN); Madagascar est, massif du Marojejy (Res. Nat. Intégr. 12) [14°26′29″S 49°44′21″E], 1300m, 2-8 Dec 1972, A. Peyrieras leg., 2 specimens (MNHN); Antananarivo prov., Manankazo env, [17°59′13″S 46°54′06″E], 9-12 Dec 1995, I. Jeniš leg., 12 specimens (MHNG); Tamatave prov., Moramanga env. [18°57′08″S 48°13′15″E], 14-18 Dec 1995, I. Jeniš leg., 1 specimen (MHNG); Tamatave prov., Moramanga 13.5 km S [19°04′19″S 48°13′45″E], 18 Dec 1957, F. Keiser leg., 3 specimens (NHMB); Madagascar centre, canton de Tsafaridy, forêt d'Amboasary [Amboasary, 24°19′60″S 45°57′0″E], Jan 1961, P. Grivèaud leg., 1 specimen (MHNG).

Distribution. Madagascar (Fig. 25). Chorotype: Malagasy (MAL).

Ecological notes. No host plants or auto-ecological data information is available for this species.

Final remarks
Diphaulacosoma is one of the 13 endemic, out of 39, flea beetle genera known in Madagascar (Biondi & D'Alessandro 2012, 2013). Recent published papers highlighted how Alticini are a taxon whose species richness is strongly underestimate in Madagascar, because of cryptic diversity and high level of microendemism (Biondi & D'Alessandro 2013; D'Alessandro et al. 2014). *Diphaulacosoma* species seem associated with forest habitats and, considering the substantial increase in the deforestation rate during the last 10 years in Madagascar (Mercier 2012), this taxon could be strongly threatened in near future. The most significant factor explaining apparent extinction is forest loss within the historical range of the focal species, suggesting that deforestation has already caused the extinction, or effective extinction, of a large number of insect species with small geographical ranges, typical for many endemic taxa in Madagascar (Hanski et al. 2007).

Acknowledgements – We are very grateful to the institutions (see list in the Material and methods paragraph) which enabled

us to study their material: Marc De Meyer (RMCA), Johannes Frisch and Bernd Jäger (ZMHB), Michael Geiser (BMNH), Antoine Mantilleri (MNHN), Roberto Poggi (MSNG), Lukáš Sekerka (NMPC), Eva Sprecher-Uebersax (NHMB).

References

Bechyné J. 1952. Nouveaux Alticides de Madagascar. Bulletin Mensuel de la Société Linnéenne de Lyon, 21: 248–251.

Bechyné J. 1964. Notizen zu den madagassischen Chrysomeloidea (Col. Phytophaga). Mitteilungen Münchner Entomologischen Gesellschaft, 54: 68–161.

Biondi M., D'Alessandro P. 2006. Biogeographical analysis of the flea beetle genus *Chaetocnema* in the Afrotropical Region: distribution patterns and areas of endemism. Journal of Biogeography 33: 720−730.

Biondi M., D'Alessandro P. 2010. Genus-group names of Afrotropical flea beetles (Coleoptera: Chrysomelidae: Alticinae): Annotated catalogue and biogeographical notes. European Journal of Entomology, 107: 401–424.

Biondi M., D'Alessandro P. 2012. Afrotropical flea beetle genera: a key to their identification, update catalogue and biogeographical analysis (Coleoptera, Chrysomelidae, Galerucinae, Alticini). Zookeys, 253: 1–158.

Biondi M., D'Alessandro P. 2013. *Ntaolaltica* and *Pseudophygasia*, two new flea beetle genera from Madagascar (Coleoptera: Chrysomelidae: Galerucinae: Alticini). Insect Systematics & Evolution, 44: 93–106.

Chevrolat L.A.A. 1836. In: Dejean P.F.M.A. (ed.) Catalogue des Coléoptères de collection de M. le Comte Dejean. Deuxième édition, revue, corrigée et augmentée, livr. 5. Librairie Méquignon-Marvis Père et Fils, Paris: 361–442.

D'Alessandro P., Urbani F., Biondi M. 2014. Biodiversity and Biogeography in Madagascar: revision of the endemic flea beetle genus *Neodera* Duvivier, 1891 with description of 19 new species (Coleoptera, Chrysomelidae, Galerucinae, Alticini). Systematic Entomology, 39: 710–748. DOI: 10.1111/syen.12082

D'Alessandro P., Samuelson A., Biondi M. 2016. Taxonomic revision of the genus *Arsipoda* Erichson, 1842 (Coleoptera, Chrysomelidae) in New Caledonia. European Journal of Taxonomy, 230: 1–61.

Döberl M. 1986. Die Spermathek als Bestimmungshilfe bei den Alticinen. Entomologische Blätter, 82: 3–14.

Duvivier A. 1891. Diagnoses de phytophages madégasses. Annales de la Société Entomologique de Belgique, 35: 238–245; 313–321; 423–424.

Evenhuis N.L. 2016. The insect and spider collections of the world website. Available at: http://hbs.bishopmuseum.org/codens/ [Last accessed: 2016-11-03]

Furth D.G., Suzuki K. 1994. Character correlation studies of problematic genera of Alticinae in relation to Galerucinae (Coleoptera: Chrysomelidae). In: Furth D.G. (ed.), Proceedings of the Third International Symposium on the Chrysomelidae, Beijing, 1992. Backhuys Publishers, Leiden: 116-135.

Furth D.G., Suzuki K. 1998. Studies of Oriental and Australian Alticinae genera based on the comparative morphology of the metafemoral spring, genitalia, and hind wing venation. In: Biondi M., Daccordi M., Furth D.G. (eds), Proceedings of the Fourth International Symposium on the Chrysomelidae. Proceedings of XX International Congress of Entomology, Firenze, 1996, Museo Regionale di Scienze Naturali, Torino: 91–124.

Hanski I., Koivulehto H., Cameron A., Rahagalala P. 2007. Deforestation and apparent extinctions of endemic forest beetles in Madagascar. Biology Letters, 3: 344–347.

Jacoby M. 1892. Descriptions of some new genera and species of phytophagous Coleoptera from Madagascar. Proceedings of the Zoological Society of London, 1892: 564–579.

Mercier J.R. 2012. Revisiting deforestation in Africa (1990–2010): one more lost generation. Madagascar Conservation & Development, 7: 5–8.

Suzuki K. 1988. Comparative morphology of the internal reproductive system of the Chrysomelidae (Coleoptera). In: Jolivet P., Petitpierre E., Hsiao T.H. (eds), Biology of Chrysomelidae. Series Entomologica 42. Kluwer Academic, Dordrecht: 317–355.

Weise J. 1910a. Chrysomelidae von Madagaskar, den Comoren, und den Inseln Ostafrikas. In: Voeltzkow A. (ed.), Reise in Ostafrika in den Jahren 1903–1905, Band II, Heft 5. E. Schweizerbartsche Verlagsbuchhandlungen, Nägele & Dr. Sproesser, Stuttgart: 419–506.

Weise J. 1910b. Chrysomelidae und Coccinellidae. In: Sjostedt Y. (ed.), Ergebnisse der schwedischen Expedition nach Kilimandjaro, vol. 7. P. Palmquists Aktiebolag, Stockholm: 153–266.