

Research articleSubmitted: October 16th, 2018 - Accepted: November 24th, 2018 - Published: December 31st, 2018**Two new species of the flea beetle genus *Psylliodes* Latreille of the *montana* species-group from Eastern Africa (Coleoptera: Chrysomelidae)**

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Abstract

In this paper, *Psylliodes afromontana* **sp. nov.** and *P. shira* **sp. nov.**, both from Eastern Africa [Kenya (Kikuyu Escarpment) and Tanzania (Kilimanjaro) respectively], are described. The two new species are attributed to the *montana* species-group, currently including four other wingless species occurring in the montane forests of Kenya and Tanzania: *Psylliodes montana* Weise, *P. kikuyana* Biondi, *P. masai* Biondi, *P. manobioides* Nadein. Micrographs of diagnostic characters, comprehending male and female genitalia are supplied. Ecological data for each species, including habitat preference, and phenology are also reported.

Key words: Alticini, new species, Afrotropical region, Kenya, Tanzania.

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Introduction

Flea beetles (Chrysomelidae, Galerucinae, Alticini) are a tribe of Coleoptera comprising over 534 genera and about 8000 species (Nadein 2012; Nadein & Bezdek 2014), occurring all over the world, and ranging from widely distributed in more than one zoogeographical region, to strictly endemic. In the Afrotropical region, including Madagascar, this tribe is occurring at least with 1600 known species, included in 102 genera, and shares a high percentage of genera with the Oriental (27%) and Palearctic (27%) regions (Biondi 2017; Biondi & D'Alessandro 2010a, 2010b, 2011, 2012, 2013a, 2013b, 2015, 2016, 2017a, 2018; Biondi et al. 2017; D'Alessandro & Biondi 2018; D'Alessandro et al. 2012, 2014, 2017, 2018; Döberl 2010). Among the widespread flea beetle genera occurring in the Afrotropical region and shared with the three zoogeographical regions, Nearctic, Palearctic and Oriental, we have: *Altica* Geoffroy, *Aphthona* Chevrolat, *Chaetocnema* Stephens, *Epitrix* Foudras, *Longitarsus* Latreille, *Phyllotreta* Chevrolat and *Psylliodes* Latreille.

The genus *Psylliodes* comprehends over 200 species worldwide, of which about 100 are occurring in the Palearctic region (Nadein 2007a). In the Afrotropical region, this flea beetle genus was known with seven species (Biondi 1996; Nadein 2007b), occurring in the eastern (Kenya and Tanzania) and in the southern (Republic of South Africa) sub-Saharan Africa.

Psylliodes afromontana **sp. nov.** and *Psylliodes shira* **sp. nov.**, two new species from Kikuyu Escarpment (Kenya) and Kilimanjaro (Tanzania) respectively, are described in this contribution. Both species are attributed to the *montana* species group sensu Biondi (1996) and Nadein (2007b), currently including four other species living in the montane forests of Eastern Africa: *Psylliodes montana* Weise 1910 (Tanzania: Kilimanjaro), *P. masai* Biondi 1996 (Kenya: Mount Elgon and Meru), *P. kikuyana* Biondi 1996 (Kenya: Elburgon, Naivasha, Molo; Tanzania: Mt. Meru), *P. manobioides* Nadein 2007b (Kenya: Mount Kenya). All these species are very similar each other in external morphology, sharing: oval outline, with elytra distinctly narrowed basally, strongly expanded beyond base, and strongly tapered to apices; wingless condition; humeral calli not raised; pronotum little transverse; hind tibia narrow and straight; hind tarsus articulated close to tibial apex; spermathecal ductus rather long and coiled (Biondi 1996; Nadein 2007b).

Material and methods

Material examined consisted of dried pinned specimens deposited at: Collection of M. Biondi, University of L'Aquila, Italy (BAQ); Muséum d'Histoire Naturelle, Bâle (= Basel) Switzerland (MHNB); Muséum National d'Histoire Naturelle, Paris, France (MNHN); Musée Roy-

al de l'Afrique Centrale, Tervuren, Belgium (RMCA). These internationally recognized acronyms follow the list of "The Insect and Spider Collections of the World Web-site" (Evenhuis 2016).

Geographical coordinates of the localities were reported in degrees, minutes and seconds (DMS-WGS84 format); coordinates and geographical information that are included in square brackets were added by the authors using information from the web site of Google Earth. Chorotypes follow Biondi & D'Alessandro (2006). Ecological notes are reported in terms of African types of vegetation, primarily the divisions and formations identified and described by Sayre et al. (2013), based on the localities where the specimens were collected. Specimens were examined, measured and dissected using a Leica M205C binocular microscope. Body parts not measurable due to damage are reported as 'undetectable' (und.). Photomicrographs were taken using a Leica DFC500 camera and the Zerene Stacker software version 1.04. Scanning electron micrographs were taken using a Hitachi TM-1000. The terminology follows D'Alessandro et al. (2016, Fig. 10E) for the median lobe of aedeagus, and D'Alessandro et al. (2016, Fig. 11F) for the spermatheca.

Measurements

LA	numerical sequence proportional to length of each antennomere
LAED	length of aedeagus
LAN	length of antennae
LB	total length of body (from apical margin of head to apex of elytra)
LE	length of elytra
LP	medial length of pronotum
LSPC	length of spermathecal capsule
WE	maximum width of elytra together
WP	maximum width of pronotum

Results

Psylliodes afromontana sp. nov. (Figs 1, 3, 8)

Diagnosis. *Psylliodes afromontana* sp. nov. is very similar to *P. shira* sp. nov. in shape, size and color (Figs 1-2). The two species are difficult to distinguish by external morphology. Based on known material, *P. afromontana* sp. nov. has: frontal tubercles absent (present, even though generally weakly delimited in *P. shira* sp. nov.), frontal carina generally wider, and more distinctly dark-bordered elytral punctation. Median lobe of aedeagus of *P. afromontana* sp. nov. (Fig. 3) is instead easily distinguishable for having: ventral surface forming a hump clearly narrow in its apical half; dorsal surface with an irregular medial carina in the central third. Such median lobe is notably similar to *P. kikuyana* (Fig. 4), even though the latter is more curved, more narrowed in the middle, and stockier

in lateral view, indicating a likely a closer affinity between the two species.

Description of the holotype (♂). Body oval, moderately convex (Fig. 1); LB = 2.14 mm, LE/LP = 2.53, WE/WP = 1.46; maximum pronotal width in middle (WP = 0.74 mm); maximum elytral width at apical third (WE = 1.08 mm). Dorsum and hind femora brown, with weak metallic reflection; antennae light brown, with weakly darkened last segments; tibiae and tarsi light brown. Head with shallow but distinct punctation on microreticulate surface; frontal carina distinctly raised, wide, rounded apically, continuous with post-clypeal area, clearly delimited posteriorly; frontal tubercles absent; frontal grooves moderately impressed near inner ocular margin. Antennae distinctly longer than half body length (LAN = 1.45 mm; LAN/LB = 0.68); LA: 100:85:69:92:85:92:92:92:119. Pronotum subrectangular, weakly transverse (LP = 0.60 mm; WP/LP = 1.23), weakly rounded laterally, with thin lateral margins; basal margin V-shaped; anterior angles bevelled, visible in dorsal view; posterior angles not prominent at all; pronotal punctation dense, moderately impressed on shallowly microreticulate surface. Metathoracic wings subapterous. Scutellum small, subtriangular. Elytra moderately elongate (LE = 1.52 mm; WE/LE = 0.71), laterally distinctly rounded, clearly convergent from basal third to apex; humeral callus not raised; post-humeral area distinctly depressed; elytral apex subtruncate; punctation arranged in 9 (+ 1 scutellar) rows, slightly larger than on pronotum, distinctly dark-bordered, and moderately impressed on sparsely micropunctate surface; lateral interstriae subcarinate. Legs with first pro- and mesotarsomere weakly dilated; hind tibial insertion close to tibial apex; apical spur of hind tibia triangular, sublaterally inserted. Venter dark brown; last visible abdominal ventrite without special preapical impressions. Median lobe of aedeagus (LAED = 0.94 mm; LE/LAED = 1.62) (Fig. 3) in ventral view slender, slightly narrowed in middle, and wider in basal half; apical part subtriangular, laterally rounded, with a large median tooth; ventral surface prominent, forming a hump clearly visible in lateral view; the hump is narrow apically in its apical half; in lateral view median lobe straight, with apical and basal part ventrally bent; dorsal surface with a medial carina in central third; dorsal ligula as long as apical third.

Variation. Paratype very similar in shape, sculpture and color to the holotype; LE = 1.52 mm; WE = 1.05 mm; LP = 0.56 mm; WP = 0.72 mm; LAN = und.; LAED = 0.94 mm; LB = 2.04 mm; LE/LP = 2.71; WE/WP = 1.46; WP/LP = 1.29; WE/LE = 0.69; LAN/LB = und.; LE/LAED = 1.62.

Type material. Holotype ♂. **Kenya:** "Afrique Orientale Anglaise [Kenya], Escarpment (Wa-Kikouyou) [Kikuyu Escarpment Forest, 00°52'S 36°41'E], viii.1904, Ch. Al-luud" (MNHN). Paratype. Same data as the holotype, 1 ♂ (MNHN).



Figs 1-2 – Habitus. 1, *Psylliodes afromontana* sp. nov., holotype ♂; 2, ditto *P. shira* sp. nov., holotype ♂.

Type locality. [Kikuyu Escarpment Forest, 00°52'S 36°41'E] (Kenya).

Distribution. Kenya (Fig. 8).

Chorotype. Northern-Eastern Afrotropical chorotype (NEA).

Host-plant. Not available

Habitat. The collection site falls within the area of Eastern African Moist Woodland & Savanna vegetation (belonging to the Tropical Lowland Grassland, Savanna & Shrubland formation).

Phenology. The two known specimens were collected in August.

DNA data. Not available.

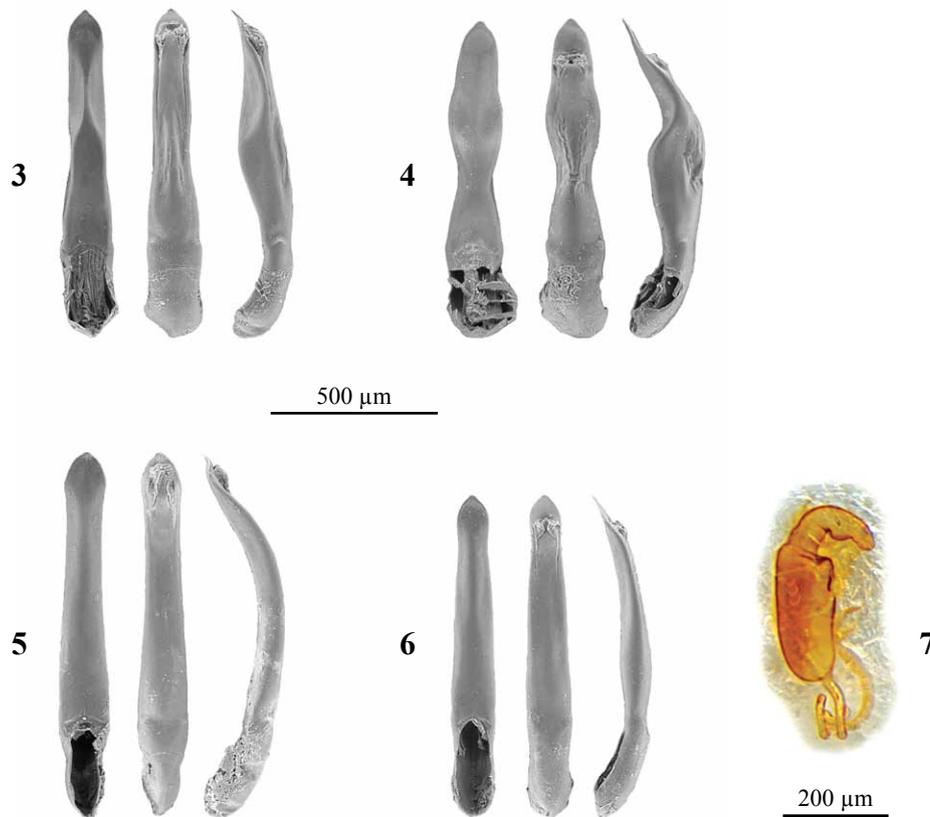
Etymology. The specific epithet of the new species refers to the continent (Africa) and to the high altitude where it was collected.

***Psylliodes shira* sp. nov.** (Figs 2, 6-8)

Diagnosis. *Psylliodes shira* sp. nov. is very similar to *P. afromontana* sp. nov. (Figs 1-2) (see Diagnosis of *P. afromontana*). However, it is probably more closely related to *P. masai*, due to the similarities in the aedeagus (Figs 5-6): slender outline both in ventral and in lateral view;

smooth surface both in ventral and dorsal view; ventral surface softly carinated in apical half. The aedeagus of the new species (Fig. 6) can be distinct mainly because less curved in lateral view and distinctly tapered to apical part in ventral view.

Description of the holotype (♂). Body oval, moderately convex (Fig. 2); LB = 1.98 mm, LE/LP = 2.85, WE/WP = 1.52; maximum pronotal width in middle (WP = 0.66 mm); maximum elytral width at apical third (WE = 1.00 mm). Dorsum brown, with metallic reflection; femora, tibiae and tarsi slightly paler; antennae light brown, with slightly darkened last segments. Head with shallow but distinct punctation on microreticulate surface; frontal carina distinctly raised, moderately wide, subacute apically, continuous with post-clypeal area; frontal tubercles moderately delimited, subtriangular; frontal grooves distinctly impressed near inner ocular margin. Antennae distinctly longer than half body length (LAN = 1.34 mm; LAN/LB = 0.68); LA: 100:91:82:91:91:95:100:95:100:123. Pronotum subrectangular, little transverse (LP = 0.52 mm; WP/LP = 1.27), straight laterally, with thin lateral margins; basal margin V-shaped; anterior angles bevelled, visible in dorsal view; posterior angles not prominent at all; pronotal punctation dense, moderately impressed on shallowly microreticulate surface. Metathoracic wings subapterous. Scutellum small, subtriangular. Elytra moderately elongate (LE = 1.48 mm; WE/LE = 0.68), laterally distinctly rounded, clearly convergent from basal third to apex; humeral callus not raised; post-humeral area distinctly depressed; elytral apex subtruncate; punctation arranged in 9 (+ 1 scutellar) rows, slightly larger than on prono-



Figs 3-7 – Genitalia. **3**, median lobe of aedeagus, from left to right, in ventral, dorsal and lateral view of *Psylliodes afrofrontana* sp. nov.; **4**, ditto of *P. kikuyana*; **5**, ditto of *P. masai*; **6**, ditto of *P. shira* sp. nov.; **7**, spermatheca of *P. shira* sp. nov.

tum, weakly dark-bordered, and moderately impressed on sparsely micropunctate surface; lateral interstriae subcarinate. Legs with first pro- and mesotarsomere weakly dilated; hind tibial insertion close to tibial apex; apical spur of hind tibia triangular, sublaterally inserted. Venter brown; last visible abdominal ventrite without special preapical impressions. Aedeagus (LAED = 0.94 mm; LE/LAED = 1.57) (Fig. 6) in ventral view slender, tapered to subapical part; apical part subtriangular, laterally rounded, with a wide median tooth; ventral surface smooth, softly carinated medially in apical half; dorsal surface smooth; dorsal ligula as long as apical fourth; in lateral view median lobe thin but slightly enlarged near the middle, weakly curved, with apex and base ventrally oriented.

Variation. Paratypes very similar in shape, sculpture and color to the holotype. Male (n = 10; mean and standard deviation; range): LE = 1.52 ± 0.08 mm ($1.42 \leq LE \leq 1.66$ mm); WE = 1.09 ± 0.07 mm ($1.00 \leq WE \leq 1.22$ mm); LP = 0.54 ± 0.03 mm ($0.52 \leq LP \leq 0.60$ mm); WP = 0.69 ± 0.03 mm ($0.64 \leq WP \leq 0.75$ mm); LAN = 1.42 ± 0.09 mm ($1.32 \leq LAN \leq 1.56$ mm); LAED = 0.95 ± 0.02 mm ($0.91 \leq LAED \leq 0.99$ mm); LB = 2.11 ± 0.11 mm ($1.96 \leq LB \leq 2.28$ mm); LE/LP = 2.79 ± 0.07 ($2.70 \leq LE/LP \leq 2.93$); WE/WP = 1.57 ± 0.06 ($1.52 \leq WE/WP \leq 1.72$); WP/LP = 1.27 ± 0.03 ($1.23 \leq WP/LP \leq 1.31$); WE/LE = 0.72 ± 0.04

($0.69 \leq WE/LE \leq 0.82$); LAN/LB = 0.67 ± 0.03 ($0.61 \leq LAN/LB \leq 0.71$); LE/LAED = 1.61 ± 0.08 ($1.52 \leq LE/LAED \leq 1.75$). Female (n = 1): LE = 1.74 mm; WE = 1.06 mm; LP = 0.64 mm; WP = 0.81 mm; LAN = 1.50 mm; LSPC = 0.26 mm; LB = 2.38 mm; LE/LP = 2.72; WE/WP = 1.31; WP/LP = 1.27; WE/LE = 0.61; LAN/LB = 0.63; LE/LSPC = 6.69. Female with first pro- and mesotarsomere not dilated. Spermatheca (Fig. 7) with subcylindrical basal part; collum clearly distinct from basal part, thickset, about half the length of apical part.

Type material. Holotype ♂. **Tanzania:** “Tanganyika [Tanzania], Kilimandjaro vers. W [$\sim 03^{\circ}04'S 37^{\circ}10'E$], Buchberger, ex coll. Dr. Breuning” (RMCA). Paratypes. Same data as the holotype, 8 ♂♂ and 1 ♀ (BAQ, RMCA). **Tanzania:** Kilimandjaro, Marangu [$\sim 03^{\circ}17'S 37^{\circ}31'E$], 1800-2300 m, i.1960, E. Haaf leg., 1 ♂ (MHNB). **Type locality.** Kilimandjaro W [$\sim 03^{\circ}04'S 37^{\circ}10'E$] (Tanzania).

Distribution. Tanzania (Fig. 8).

Chorotype. Northern-Eastern Afrotropical chorotype (NEA).

Host-plant. Not available

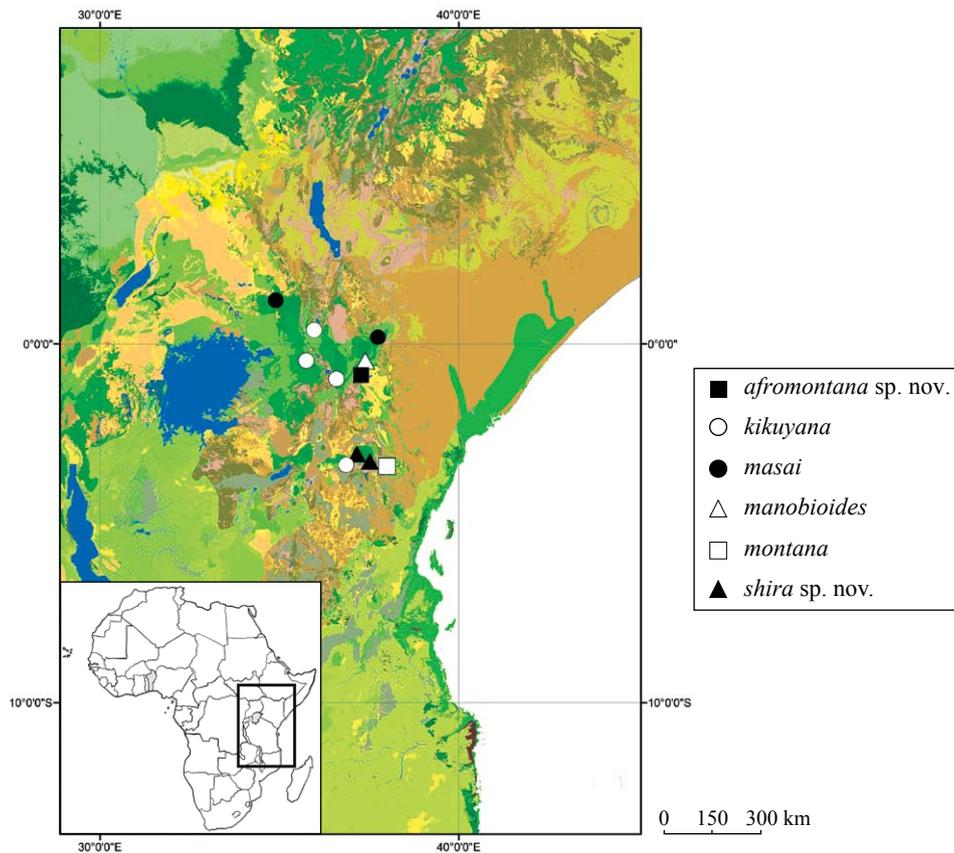


Fig. 8 – Geographic distribution of *Psylliodes montana* species group.

Habitat. The two collection sites fall within the area of Eastern African Xeric Scrub vegetation (belonging to the Warm Desert & Semi-Desert Scrub & Grassland formation) and Afromontane Moist Forest vegetation (belonging to the Tropical Montane Humid Forest formation) at elevations between 1800 and 2300 m a.s.l.

Phenology. The specimen from Marangu was collected in January.

DNA data. Not available.

Etymology. The specific epithet of the new species is after Shira, one of the three cones of the Kilimanjaro, the dormant volcano where the species was collected.

Discussion

The Eastern Arc Mountains of Tanzania and Kenya, as all high mountains in general, are of high interest because they may host biogeographic indicators that contribute to understand the geological and climatic history of the area and the evolutionary processes involving its biota (Hemp et al. 2015; Hemp & Hemp 2018). The restricted geographic distribution of *Psylliodes afromontana* sp. nov.

and *P. shira* sp. nov., in addition to the ones of the already known species of the same group (Fig. 8), supports the idea that *Psylliodes montana* species group is the outcome of the typical phenomenon of diversification from a common ancestor due to isolation in high mountains. The wing reduction shown by all the species is also associated with life at high altitude (cf. Furth 1980; Biondi & D’Alessandro 2017b; Grzywacz et al. 2018), and it contributes itself to the rate of diversification among incipient species. Other species in different taxonomic groups was recently described showing similar features (e.g. Grebennikov 2017; Weirauch et al. 2017). The high number of new species still being described in recent taxonomic papers demonstrate that, notwithstanding the Eastern Arc Mountains of Tanzania and Kenya is renowned as one of 35 global biodiversity hotspots (Myers et al. 2000; Mittermeier et al. 2011), its biodiversity, and in general the biodiversity in the tropics in the southern hemisphere, is still poorly known, especially among invertebrates (Biondi & D’Alessandro 2010a, 2012; Grebennikov 2017; Nadein & Bezděk 2014).

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