Fragmenta entomologica, 49 (2): 151-158 (2017)

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

Research article
Submitted: November 16th, 2017 - *Accepted*: December 8th, 2017 - *Published*: December 29th, 2017

Hesperoides, a new "hairy" flea beetle genus from southern Africa (Coleoptera: Chrysomelidae, Galerucinae, Alticini)

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Abstract
Hesperoides afromeridionalis **gen. nov.** and **sp. nov.** from the Republic of South Africa (Western and Eastern Cape Provinces and KwaZulu-Natal) is described. Despite some similarities with *Hespera* Weise, it exhibits major affinities with the genera attributed to the subtribe Aphthonini, especially with *Aphthona* Chevrolat and *Montiaphthona* Scherer. Data on distribution are supplied, along with preliminary ecological notes. Photomicrographs of main morphological characters, including male and female genitalia, and metafemoral extensor tendon are provided. Key to the six "hairy" flea beetle genera occurring in sub-Saharan African and their habitus photos are also given.

Key words: *Hesperoides afromeridionalis*, new genus, new species, Coleoptera, Chrysomelidae, Afrotropical region, Republic of South Africa.

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Introduction

Alticini are a tribe of small to medium sized Coleoptera Chrysomelidae, named 'flea beetles' because of the presence of a metafemoral extensor tendon that enable them to jump (Furth & Suzuki 1998; Nadein & Betz 2016). It is included within the subfamily Galerucinae, along with the closely related Galerucini (Bouchard et al. 2011). Both the adult and larval stages feed on stems, leaves or roots, and rarely on flowers, in almost all the higher plant families, generally with high levels of specialization (Jolivet & Verma 2002; Urbani et al. 2015). It is probably the largest and most diverse tribe of Chrysomelidae, comprising about 600 genera and 8000 species (Insektoid.Info 2017; Nadein 2012; Nadein & Bezděk 2014). Some genera are widespread in more than one zoogeographical region (i.e. *Altica* Geoffroy, *Aphthona* Chevrolat, *Chaetocnema* Stephens, *Longitarsus* Berthold, etc.) while others are strictly endemic to very limited areas (Biondi & D'Alessandro 2017). The highest species richness occurs in the tropics of the southern hemisphere, even though our knowledge about this tribe is still uncomplete for those areas (Biondi & D'Alessandro 2010, 2012; Nadein & Bezděk 2014). Based on recent contributions, the whole Afrotropical region, including Madagascar, hosts about 1600 known species ascribed to 101 different genera (Biondi personal data; Biondi & D'Alessandro 2010, 2012, 2013a, 2013b, 2015, 2016, 2017, 2018; Biondi et al. 2017; D'Alessandro et al. 2014, 2017; Döberl 2010), and shares the highest percentage of genera with the Oriental (27%) and Palaearctic (27%) regions (Biondi & D'Alessandro 2012). In the sub-Saharan Africa occur 84 different flea beetle genera of which about 64% are endemic (Biondi & D'Alessandro 2010, 2012; Biondi et al. 2017). The Southern Afrotropical area (SAF as reported in Biondi & D'Alessandro 2012) hosts 58 genera of Alticini, 12% of which are endemic.

In this contribution, an interesting new flea beetle genus from the Republic of South Africa (Western and Eastern Cape Provinces and KwaZulu-Natal), *Hesperoides* **gen. nov.**, is described. This new genus shows, as more evident external characteristic, a distinct pubescence on the dorsal integuments, which is not common in Alticini. In fact, in sub-Saharan Africa, only 6 genera out of 84 can be considered "hairy": *Epitrix* Foudras, *Eriotica* Harold, *Hespera* Weise, *Hesperoides* **gen. nov.**, *Homichloda* Weise, and *Sanckia* Duvivier. This characteristic, however, seems to have no phylogenetic meaning in the systematics of Alticini.

Materials and methods

Material examined consists of dried pinned specimens deposited at: BAQ: collection of M. Biondi, Dipartimento di Medicina clinica, Sanità pubblica, Scienze della Vita e dell'Ambiente, Università dell'Aquila, Italy; BMNH: The

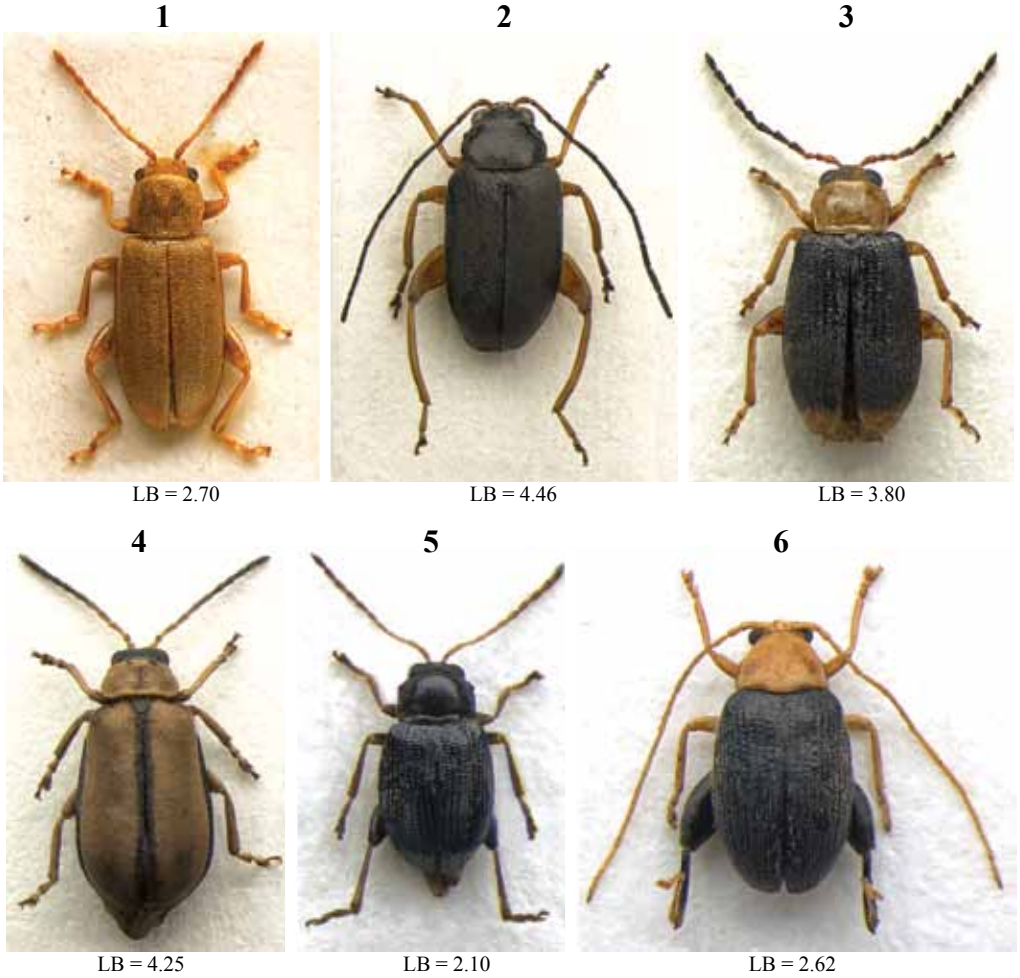
Natural History Museum, formerly British Museum (Natural History), London, Great Britain; ZMHB: Museum für Naturkunde der Humboldt-Universität, Berlin, Germany; MNHN: Muséum National d'Histoire Naturelle, Paris, France; NMPC: Entomologické oddělení Národního muzea, Praha-Kunratice, Czech Republic; SANC: South African National Collection of Insects, Pretoria, Republic of South Africa. These internationally recognized acronyms follow the list on 'The Insect and Spider Collections of the World Website' (Evenhuis 2017).

Specimens were examined, measured and dissected using a Leica M205C binocular microscope. 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. Ten males and ten females were measured to determine the mean, standard deviation and range of some morphometric measurements for each sex. The terminology follows D'Alessandro et al. (2016, Fig. 10E) for the median lobe of aedeagus, Döberl (1986), Furth & Suzuki (1994) and Suzuki (1988) for the spermatheca, and Furth (1982), Furth & Suzuki (1998) and Nadein & Betz (2016) for the metafemoral extensor tendon.

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).

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



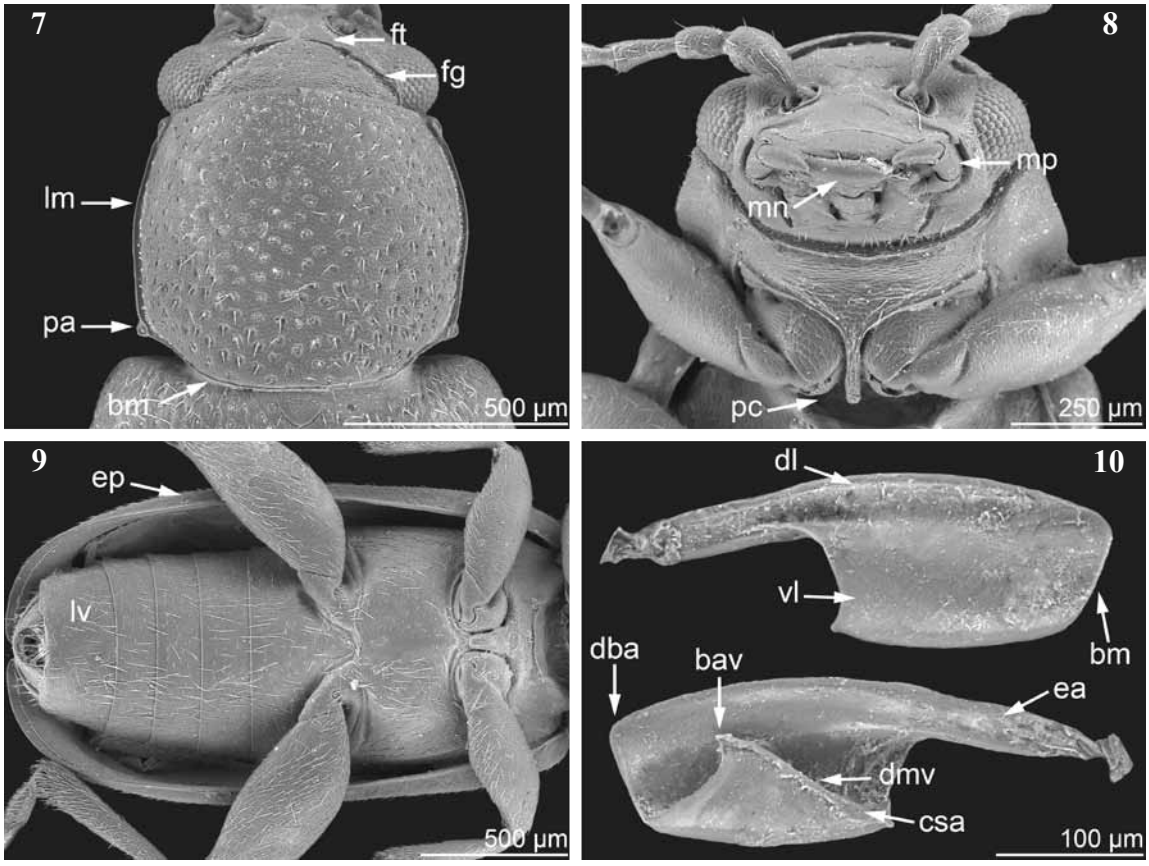
Figs 1-6 – Habitus: **1**, *Hesperoides afromeridionalis* **sp. nov.**; **2**, *Hespera africana* Jacoby; **3**, *Eriotica fuscipennis* Harold; **4**, *Homichloda barkeri* (Jacoby); **5**, *Epitrix aethiopica* Weise; **6**, *Sanckia longicornis* (Jacoby). Abbreviations: LB = body length (in mm).

Results

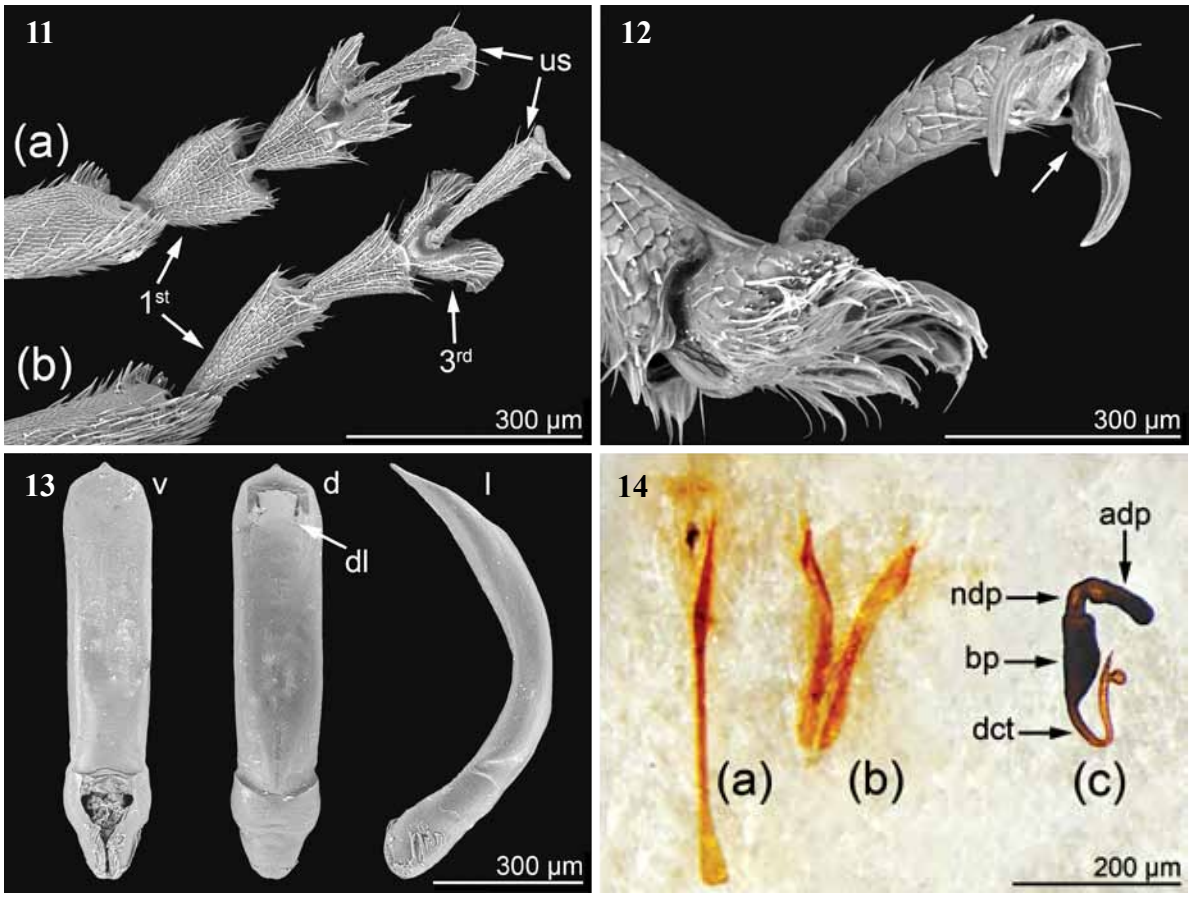
Hesperoides gen. nov.

Diagnosis. The new genus exhibits some external morphological similarities with *Hespera* Weise, another "hairy" genus occurring in the Afrotropical region: body elongate and weakly convex (Figs 1-2); pronotal and elytral surface uniformly pubescent (Fig. 7); pronotum without any dimples or antebasal sulci (Fig. 7); elytral margins not or very finely bordered laterally; tarsal claws subappendiculate (Fig. 12). *Hespera*, however, is a genus that occupies a basal position within Alticini, sharing several symplesiomorphies with Galerucini (Ge et al. 2012), while *Hesperoides* **gen. nov.** exhibits characters, such as the compact shape of the median lobe of aedeagus (Fig. 13), the spermatheca of "alticine type" (Type A of Furth & Suzuki 1994) (Fig. 14 c), and the anterior and posterior sclerotization of the vaginal palpi not connected (Fig. 14 b), that allow to attribute it to the more "modern" Aphthonina subtribe (= tribe Aphthonini sensu Konstantinov 1998). Very probably, also the genus *Penghou* Ruan, Konstantinov, Prathapan, Ge & Yang, recently described from China and considered probably related to *Hespera* (Ruan et al. 2015), has to be included in this flea beetle subtribe. Therefore, despite the different external appearance, *Hesperoides* **gen. nov.** should be considered closely related, in subSaharan Africa, mainly to *Aphthona* Chevrolat and *Montiaphthona* Scherer (Biondi & D'Alessandro 2012).

Description. Body elongate, little convex (Fig. 1). Pronotum and elytra clearly and uniformly pubescent (Fig. 7); head mostly glabrous. Frons (Figs 7-8) flat, with subtrapezoidal, not raised and distinctly delimited tubercles; frontal carina flat, not delimited laterally; frontal grooves distinctly impressed, straight, oblique; maxillary and labial palpi slender. Antennae slightly longer than half body length. Pronotum (Fig. 7) subtrapezoidal, slightly wider posteriorly, weakly transverse, moderately rounded laterally, with weakly expanded lateral margins; basal margin widely sinuate; anterior and posterior angles distinctly protruding; pronotal punctation densely and uniformly im-



Figs 7-10 – Morphological features of *Hesperoides afromeridionalis* **sp. nov.**, ♂. **7**, vertex and pronotum; **8**, frons, mouthparts, and prosternum; **9**, mesosternum, metasternum and abdomen; **10**, metafemoral extensor tendon. Abbreviations in Figs 7-9: bm = basal margin of pronotum; ep = elytral epipleurae; fg = frontal grooves; ft = frontal tubercles; lm = lateral margin of pronotum; lv = last visible abdominal ventrite; mn = mandible; mp = maxillary palpi; pa = posterior angle of pronotum; pc = procoxal cavities. Abbreviations in Fig. 10: bav = basal angle of ventral lobe; bm = basal margin of tendon; csa = cuticolar sheet attachment; dba = dorsal-basal angle of tendon; dl = dorsal lobe; dmv = dorsal margin of ventral lobe; ea = extended arm of dorsal lobe; vl = ventral lobe.



Figs 11-14 – Morphological features of *Hesperoides afromeridionalis* **sp. nov. 11**, front **(a)** and hind **(b)** tarsus (♂); **12**, ungueal segment with subappendiculate claw (arrow); **13**, aedeagus; **14**, tignum **(a)**, vaginal palpi **(b)** and spermatheca **(c)**. Abbreviations in Fig. 11: 1st = first tarsomere; 3nd = third tarsomere; us = ungueal segment. Abbreviations in Figs 13-14: adp = apex of the distal part; bp = basal part (also referred as proximal part); d = dorsal view; dct = ductus; dl = dorsal ligula; dp = distal part (also referred as apical part); l = lateral view; ndp = neck of the distal part; v = ventral view.

pressed, with bearing setae points. Elytra (Fig. 1) elongate, laterally subparallel, with lateral margin finely bordered but well visible in dorsal view; punctation confusely impressed; elytral epipleurae (Fig. 9) slightly downward oriented, visible up to the preapical part in lateral view. Legs with moderately enlarged hind femora (Fig. 9); apical spur of tibiae short and thin, present on all the legs; fourth visible meso- and metatarsomere deeply incised (Fig. 11 b); ungueal segment elongate (Figs 11-12); tarsal claws subappendiculate (Fig. 12). Aedeagus (Fig. 13) in ventral view laterally subparallel, apically widely subtriangular, with short dorsal ligula, and elongate distally rounded phallobasis. Spermatheca (Fig. 14 c) of "alticine type" (Type A of Furth & Suzuki 1994), with distal part well distinct from basal part and ductus uncoiled, not invaginated in the basal part. Vaginal palpi with not connected anterior and posterior sclerotization (Fig. 14 b). Tignum as in Fig. 14 a. Metafemoral extensor tendon (Fig. 10) with slightly curved dorsal lobe; extended arm elongate; basal angle of ventral lobe acute; dorsal margin of ventral lobe straight and strongly angled down; recurve flange absent; cuticolar sheet attachment visible; dorsal-basal angle of the tendon almost right; ventral-basal angle of tendon widely obtuse; tendon basal edge straight. Metafemoral extensor tendon of this new genus can be attributed to the *Blepharida* Morpho-Group (Furth 1982; Furth & Suzuki 1998).

Type species. *Hesperoides afromeridionalis* **sp. nov.**

Etymology. The name of the new flea beetle genus refers to its apparent similarity with the genus *Hespera*.

Distribution. Southern Africa (Fig. 15).

***Hesperoides afromeridionalis* sp. nov.**

Description of the holotype (♂). Body elongate, little convex (Fig. 1); LB = 2.70 mm; maximum pronotal width at middle (WP = 0.76 mm); maximum elytral width at apical third (WE = 1.05 mm). Dorsum, head, antennae and legs yellowish; both pronotum and elytra clearly pubescent.

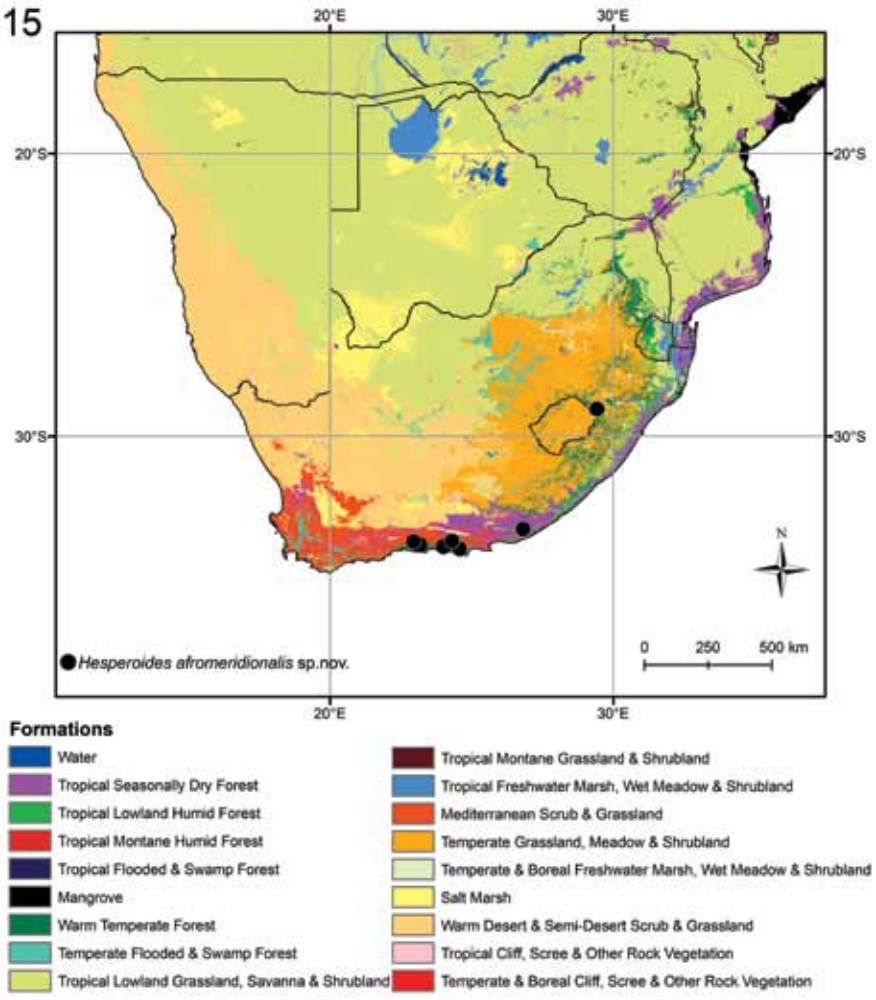


Fig. 15 – Geographic distribution of *Hesperoides afromeridionalis* **sp. nov.**

Head surface microreticulate (Fig. 7-8); frontal tubercles subtrapezoidal, flat, but distinctly delimited; frontal carina flat, not delimited laterally; frontal grooves distinctly impressed, straight, oblique, delimiting the frontal tubercles posteriorly, and reaching the upper ocular margin; maxillary and labial palpi slender, yellowish; mandibles dark brown; eyes small (interocular space width about three times transversal diameter of each eye). Antennae slightly longer than half body length (LAN = 1.58 mm; LAN/LB = 0.58); LA = 100:69:92:77:104:85:100:92:92:92:131. Pronotum (Fig. 7) subtrapezoidal, slightly wider posteriorly, weakly transverse (LP = 0.69 mm; WP/LP = 1.11), moderately rounded laterally, with weakly expanded lateral margins; basal margin widely sinuate; anterior angles moderately prominent and rounded; posterior angles distinctly protruding; pronotal punctation densely and uniformly impressed, with bearing setae points. Metathoracic wings macropterous. Elytra elongate (LE = 1.93 mm; WE/LE = 0.55), laterally subparallel (Fig. 1); lateral margin slightly expanded, especially in basal half, and visible in dorsal view; punctation confused, similar to the pronotal one in size and density (Fig. 1). First pro- and mesotarsomeres (Fig. 11 a) clearly dilated; apical spur of tibiae dark brown. Venter yellowish, pubescent (Fig. 9); last visible abdominal ventrite without special preapical sculptures. Aedeagus (LAED = 0.90 mm; LE/LAED = 2.14) (Fig. 13) in ventral view laterally subparallel, apically obtusely angled, with a median small tooth; surface smooth, with a shallow ventral sulcus; phallobasis elongate, basally rounded; dorsal ligula very short, subrectangular; in lateral view aedeagus regularly and strongly curved.

Variation. Male (n = 10; mean and standard deviation; range): LE = 2.07 ± 0.12 mm (1.93 ≤ LE ≤ 2.33 mm); WE = 1.15 ± 0.12 mm (1.00 ≤ WE ≤ 1.35 mm); LP = 0.71 ± 0.05 mm (0.68 ≤ LP ≤ 0.83 mm); WP = 0.84 ± 0.06 mm (0.76 ≤ WP ≤ 0.95 mm); LAN = 1.65 ± 0.07 mm (1.58 ≤ LAN ≤ 1.80 mm); LAED = 0.91 ± 0.05 mm (0.88 ≤ LAED ≤ 1.03 mm); LB = 2.82 ± 0.14 mm (2.60 ≤ LB ≤ 3.03 mm); LE/LP = 2.90 ± 0.07 (2.80 ≤ LE/LP ≤ 2.96); WE/WP = 1.37 ± 0.09 (1.21 ≤ WE/WP ≤ 1.48); WP/LP = 1.18 ± 0.04 (1.11 ≤ WP/LP ≤ 1.22); WE/LE = 0.56 ± 0.03 (0.51 ≤ WE/

LE ≤ 0.60); LAN/LB = 0.59 ± 0.02 (0.56 ≤ LAN/LB ≤ 0.63); LE/LAED = 2.28 ± 0.15 (2.02 ≤ LE/ LAED ≤ 2.58). Female (n = 10; mean and standard deviation; range): LE = 2.20 ± 0.13 mm (1.90 ≤ LE ≤ 2.38 mm); WE = 1.21 ± 0.08 mm (1.05 ≤ WE ≤ 1.28 mm); LP = 0.70 ± 0.04 mm (0.60 ≤ LP ≤ 0.75 mm); WP = 0.88 ± 0.06 mm (0.78 ≤ WP ≤ 0.98 mm); LAN = 1.48 ± 0.09 mm (1.28 ≤ LAN ≤ 1.60 mm); LSPC = 0.20 ± 0.02 mm (0.18 ≤ LSPC ≤ 0.23 mm); LB = 2.88 ± 0.18 mm (2.45 ≤ LB ≤ 3.13 mm); LE/LP = 3.17 ± 0.06 (3.08 ≤ LE/LP ≤ 3.28); WE/WP = 1.38 ± 0.04 (1.32 ≤ WE/WP ≤ 1.45); WP/LP = 1.27 ± 0.04 (1.20 ≤ WP/LP ≤ 1.32); WE/LE = 0.55 ± 0.02 (0.51 ≤ WE/LE ≤ 0.58); LAN/LB = 0.52 ± 0.02 (0.48 ≤ LAN/LB ≤ 0.55); LE/LSPC = 11.22 ± 1.25 (9.50 ≤ LE/LSPC ≤ 13.14). Paratypes very similar in sculpture and color to the holotype. Female slightly darker, with first pro- and mesotarsomeres not enlarged, more elongate elytra (distinctly higher LE/LP), and slightly shorter antennae. Spermatheca (Fig. 14 c) with narrow and elongate basal part; apical part formed by short neck and elongate and thick distal part; ductus elongate and uncoiled, apically inserted.

Type material. Holotype ♂: Republic of South Africa: Western Cape, S of Prince Alfred's pass [33°50.12'S 23°09.97'E], 24 Dec 2007, M. Snížěk leg. (BAQ). Paratypes: same data of the holotype, 24 ♂♂ and 6 ♀♀ (BAQ; BMNH; MNHN; NMPC); Eastern Cape, Kareedouw pass, 33°57.6'S 24°16.15'E, 450 m, 16 Nov 2006, G. Osella lgt, 7 ♂♂ and 8 ♀♀ (BAQ; SANC); ditto, 1230 m [33°54.5'S, 24°02.87'E], 3 ♂♂ and 3 ♀♀ (BAQ); Eastern Cape, W Bisho, 35 km from Peddie, 33°16.69'S 26°48.95'E, 280 m, 14 Nov 2006, G. Osella lgt, 1 ♂ and 1 ♀ (BAQ); Natal, Drakensberg, Monks Cowl, 29°03'S 29°24'E, 1400 m, 9 Nov 1993, F. Koch lgt, 1 ♂ (ZMHB); ditto, K. Ebert & M. Uhlig lgt, 1 ♀ (ZMHB); Natal, Dragon Peaks Park, 1115-1450 m, 29°02'S 29°26'E, lux, 9-12 Nov 1993, J. Deckert lgt, 1 ♂ (ZMHB).

Type locality. Republic of South Africa: Western Cape, S of Prince Alfred's pass [33°50.12'S 23°09.97'E].

Etymology. The name of this new species refers to the geographic region where it lives and means "from southern Africa".

Distribution. Republic of South Africa: eastern part of Western Cape Province, Eastern Cape Province and KwaZulu-Natal (Fig. 15). Chorotype: Southern-Eastern African (SEA).

Ecological notes. No ecological notes are available for this new species. However, the collecting localities are included mainly within two different vegetation types: Mediterranean Scrub & Grassland (Fynbos and Renosterveld) and Temperate Grassland, Meadow & Shrubland (Moist Highveld Grassland) (Fig. 15) (Sayre et al. 2013).

Key to sub-Saharan African "hairy" flea beetle genera

1. Pronotum with a distinct ante-basal transverse sulcus 2
- Pronotum without ante-basal transverse sulcus 3
2. Pronotum pubescent, as wide as elytra basally, subparallel or convergent towards anterior laterally; ante-basal sulcus bounded by two short longitudinal striae laterally. Frontal tubercles very small, elongate and narrow. Antennomere 4 distinctly shorter than antennomeres 2-3 together. Body less elongate (LB/WE < 2.00). Elytra not modified apically in male. Distribution: worldwide ..... *Epitrix* Foudras (Fig. 5)
- Pronotum glabrous, narrower than elytra basally, divergent towards anterior laterally; ante-basal sulcus not bounded by longitudinal striae laterally. Frontal tubercles larger, subrectangular or subtriangular, often elongate towards upper ocular margin. Antennomere 4 as long as antennomeres 2-3 together. Body more elongate (LB/WE ≥ 2.00). Elytra with modified structures apically in male. Distribution: eastern Africa and Yemen (Socotra) ..... *Eriotica* Harold (Fig. 3)
3. First metatarsomere about as long as half length of hind tibia. Elytral punctation arranged in regular, or partially irregular, rows, distinctly impressed. Distribution: subSaharan Africa, Madagascar and Oriental region .... *Sanckia* Duvivier (Fig. 6)
- First metatarsomere distinctly shorter than half length of hind tibia. Elytral punctation confused 4
4. Pronotum with a distinct sublateral dimple on each side; pronotal surface not or very sparsely pubescent. Elytral margins widely bordered laterally. Tarsal claws distinctly appendiculate. Distribution: eastern Africa .... *Homichloda* Weise (Fig. 4)
- Pronotum without any dimples; pronotal surface uniformly pubescent (Fig. 7). Elytral margins not or very finely bordered laterally. Tarsal claws subappendiculate (Fig. 12) 5
5. Vertex and frons distinctly pubescent. Pronotal base regularly rounded and not protruding posterior angles. Lateral margin of elytra not visible in dorsal view. Legs slender, generally with arcuate tibiae and subcylindrical first tarsomeres (Fig. 2). Median lobe of aedeagus generally slender, apically narrowed and elongate; phallobasis basally truncate. Spermatheca of "galerucine type" (Type B of Furth & Suzuki 1994: Fig. 13 c), with short and globose basal part, and very short ductus, partially invaginated in the basal part. Distribution: sub-Saharan Africa, Eastern Palaearctic and Oriental regions) ..... *Hespera* Weise (Fig. 2)
- Vertex and frons not or only very sparsely pubescent (Figs 7-8). Pronotal base widely sinuate and protruding posterior angles (Fig. 7). Lateral margin of elytra thin but visible in dorsal view. Legs thicker, with straight tibiae and subtriangular first tarsomeres (Figs 1, 11). Median lobe of aedeagus (Fig. 13) thicker, apically not narrowed and elongate; phallobasis basally rounded. Spermatheca (Fig. 14 c) of "alticine type" (Type A of Furth & Suzuki 1994), with narrow and elongate basal part; distal part elongate, well distinct from basal part; ductus elongate, uncoiled, apically inserted, not invaginated in the basal part. Distribution: southern Africa .. .. *Hesperoides* **gen. nov.** (Fig. 1)

Acknowledgements – I am very grateful to Johannes Frish and Bernd Jäger (ZMHB), which enabled me to study the material preserved in their institution, and to my friend Giuseppe Osella, for providing me the interesting flea beetle material collected in South Africa. Finally, I am deeply indebted to Paola D'Alessandro for her precious help and assistance in the preparation of this paper.

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