

Research article

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A new species of *Leucocelis* (*Amauroleucocelis*) Bourgoïn, 1913 from Burundi (Coleoptera: Scarabaeidae, Cetoniinae, Leucocelina)

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Abstract

Leucocelis (*Amauroleucocelis*) *vingerhoedti* sp. nov. is hereby described from specimens collected recently in Burundi. The species is most closely related to the high-altitude *L. (A.) jeanneli* (Bourgoïn, 1913), currently known from Kenya, Tanzania and Cameroon. *L. (A.) vingerhoedti* differs from the latter species mainly in its dorsal ornamentation, which lacks the yellowish oblique band across the elytral disc and the midline band on pronotum and scutellum that, on the other hand, are typically found in *L. (A.) jeanneli*. The elytral costae of the new species are also more prominent and elevated than in *L. (A.) jeanneli*, and finally their aedeagal parameres differ by virtue of both apical and basal extensions being longer but narrower in *L. (A.) vingerhoedti* by comparison of those of *L. (A.) jeanneli*. Also, the internal lobes are substantially wider in *L. (A.) jeanneli* than in *L. (A.) vingerhoedti*, while the external ones are protruding further forward in the latter species. *L. (A.) vingerhoedti* occurs in forest habitat and like most other species of the genus is presumably floricolous.

Key words: Afrotropical Realm, Central Africa, new species, high altitude habitat, regional endemisms

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Introduction

The subgenus *Amauroleucocelis* Bourgoïn, 1913 currently includes all the species and subspecies previously grouped under the homonymous genus and under the subgenus *Acheilosis* Ruter, 1967. It was originally erected by Bourgoïn (1913) as an intermediate between “*Discopeltis* Burm. et *Leucocelis* Burm.”, to accommodate *A. jeanneli*, a high-altitude species recorded initially only in East Africa, but later also in Cameroon (Antoine 2002; Beinhundner 2017). Bourgoïn (1913) did not, however, elaborate on the diagnostic differences between this new genus and those previously described earlier by Burmeister (1842). On the other hand, Antoine (2002) while analysing the historical series of *A. jeanneli* used by Bourgoïn in his earlier description, in order to designate a lectotype and a couple of paralectotypes, came to the conclusion that all the potential diagnostic characters exhibited by this taxon were identical to those of *Leucocelis* (*Acheilosis*). This led to the synonymization of the junior name of *Acheilosis* with *Amauroleucocelis* and the establishment of the current subgenus *Leucocelis* (*Amauroleucocelis*).

The key apomorphic characters of the subgenus have been analysed in great detail by Antoine (1997). The critical one refers to aedeagal parameres, which are unmerged and only connected to the base by poorly sclerified tissue and also exhibit external lobes partly split in their apical region. Of particular relevance here are also a bilobed clypeus, a short truncated or rounded mesosternal process, a partly reborded ventral margin in the pygidium and the presence of tomentose areas on the body surface (Antoine 1997). The only significant sexual dimorphism in the subgenus lies in the metatibial spurs, which are slightly shorter and rounder in the female, by comparison with the sharp structure observed in the male counterpart (Antoine 2002). Aside from this though, there is no real sexual dimorphism in the metatibia proper of this subgenus, unlike in the nominal subgenus *Leucocelis*, where the male exhibits much denser setation on its ventral surface, with the distal edge generally protracted into a hook-shaped flat process (cf. Holm & Marais 1992).

The subgenus currently includes 26 species and two subspecies distributed across West, Central and East Africa, marginally reaching the southern part of the continent

in Angola and Mozambique (Beinhundner 2017). Recent collections in Burundi have revealed the existence of another species new to science and relatively close to *L. (A.) jeanneli*. This is described herein, along with an update on the general systematics and biogeography of the subgenus.

Materials and Methods

Specimens described in this study were examined directly and dissected when necessary. Types and other specimens used for comparison were provided by the curators or owners of the collections where they are currently deposited (see list below). Original collecting data accompanying each specimen were also obtained from key holders of material of interest. Taxonomic as well as distribution and ecological data were obtained from key literature sources providing quality illustrations and collecting data, including Bourgoïn (1913), Antoine (2002) and Beinhundner (2017). For each taxon, data records are reported with the number of individuals and their respective sex, if verified. Otherwise, such details are omitted and only a generalized reference to an unspecified number (n) of individuals (inds) is given.

The Cetoniinae morphological terminology followed in this study for the description of specimen characters is derived from Krikken (1984) and Holm & Marais (1992). Photos of specimen dorsal, lateral and ventral habitus were taken with a Canon digital camera EOS 600D fitted with Sigma EX DG Macro HSM lens (105 mm) and pictures were processed using Helicon Focus 8.2.5 software. Aedeagal parameres were analysed and photographed under a Leica EZ4 W, and pictures were processed using Zerene Stacker software. In order to increase the clarity of resolution, the background, pin holes and other disruptive features were removed from each photo using Microsoft Word 2010 (Picture Tools).

In the text, specimens size refers to measurements of total body length (TL), taken from the tip of the clypeus to the tip of the pygidium, and maximum body width (MW), taken at the widest point of the elytra. All measurements are expressed in millimetres and were taken with a Vernier calliper. Abbreviations of types are as follows: **HT**, Holotype; **LT**, Lectotype; **ST(s)**, Syntype(s); **PT(s)**, Paratype(s); **PLT(s)**, Paralectotype(s).

Institutes and collections are abbreviated as follows:

BMCS – Jonathan Ball & Andre Marais Private Collection, Cape Town, South Africa;

DMOU – Daniel Moore Private Collection, Oro Valley, Arizona, USA;

GBEG – Gerhard Beinhundner Private Collection, Euerbach, Germany;

MNHN – Muséum national d'Histoire naturelle, Paris, France;

PARF – Ex Collection Philippe Antoine, Roubaix, France;

PLEB – Philippe Léonard Private Collection, Embourg, Belgium;

PMBC – Petr Malec Private Collection, Brno, Czech Republic;

RBINS – Royal Belgian Institute of Natural Sciences, Bruxelles, Belgium;

TGMF – Thierry Garnier Private Collection, Montpellier, France.

Results and Taxonomy

Leucocelis (Amauroleucocelis) vingerhoedti sp. nov.

(Figs 1, 3, 4)

Diagnosis. The new species is most closely related to *L. (A.) jeanneli*, which was originally described as the only member of the then genus *Amauroleucocelis* (Bourgoïn 1913). With it, *L. (A.) vingerhoedti* shares part of the chromatic dorsal ornamentation, being also mainly dark green with some testaceous-yellowish areas on the apical region of the elytral disc and on elytral and pronotal lateral margins as well as on clypeal surface (Figs 1 and 2). It differs from *L. (A.) jeanneli* by lacking the oblique stripes on the elytral disc and the longitudinal central band on the pronotum and scutellum. These are replaced by rust brown areas, in the shape of an inverted face on the pronotum, discal and marginal bands on elytra and variable triangular area on scutellum (Fig. 1 A). It also exhibits markedly raised elytral costae by comparison with *L. (A.) jeanneli* and most other species of the genus. The leg joints are dark brown to black in the new species, while they are reddish brown in *L. (A.) jeanneli* and undifferentiated from the rest of the leg surface (Figs 1 A, 2 A). The mesometasternal process is wider and mostly dark coppery-purple in *L. (A.) vingerhoedti*, but detectably narrower and metallic green to light coppery in *L. (A.) jeanneli*. In particular, the mesosternal lobe is slightly less produced forward in the former species than in the latter and exhibits a light brown colour, rather than metallic green like in *L. (A.) jeanneli* (Figs 2 A, 2 B). Finally, the aedeagal parameres of the two species are substantially different in the size of both their apical and basal extensions, with those of the new species being broader but shorter than those of *L. (A.) jeanneli* (Fig. 1 F, G). Also, within the apical part, the inner lobes of *L. (A.) vingerhoedti* are wider and the external ones protrude further forward than in *L. (A.) jeanneli*.

Description of holotype ♂

Size: TL = 10.5 mm; MW = 5.0 mm

Dorsum. Body shape with typical *Amauroleucocelis* pattern, moderately deplanate and with elytral surface tapering remarkably from base to apex, with widest part at humeral callus followed by marked subhumeral arch; matte without cretaceous markings or tomentum, but exhibiting a dark green background colour interspersed with rust brown and

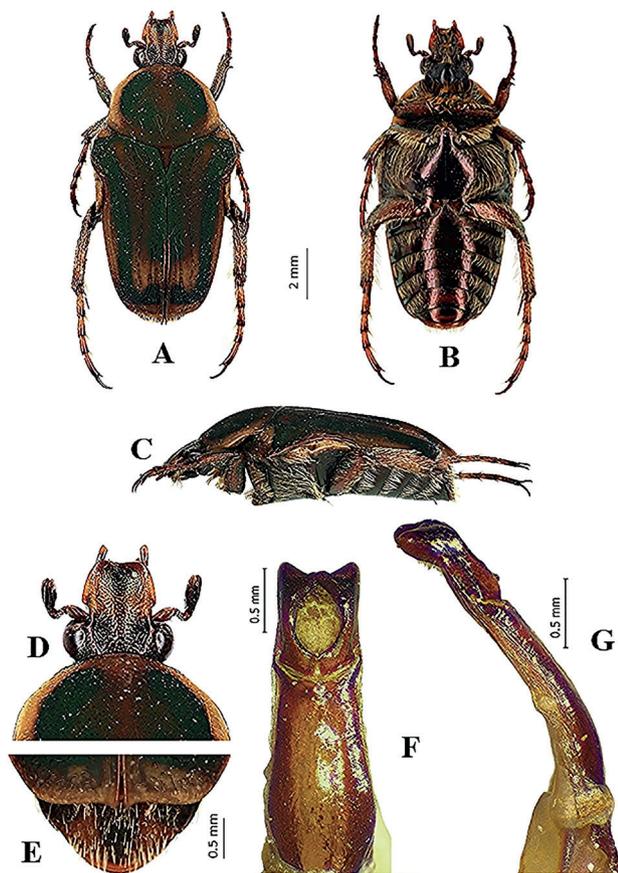


Fig. 1 – *Leucocelis (Amauroleucocelis) vingerhoedti* sp. nov., HT♂: dorsal habitus (A); ventral habitus (B); lateral habitus (C); clypeus (D); pygidium (E); parameres, dorsal view (F); parameres, lateral view (G). Photos: A-E, Philippe Léonard; F-G, Berdien Daniels.

yellow to testaceous areas in various places across entire surface; elytral apex with sharp point at sutural joint; with simple round to elongate punctures across entire surface, becoming more dense on head and of geminate type on apical region of elytral striae; largely glabrous with scattered short and tawny setae only along margins, becoming longer and denser on legs and mesepimeron (Fig. 1 A, C).

Head. Mainly testaceous-yellow, with brown margins and dark green areas on clypeal disc and vertex; clypeal surface moderately concave with lateral and anterior margins gently upturned, latero-apical corners smoothly rounded and apex mildly sinuate; lateral margins widest at supra-ocular antennal cavity, tapering gradually toward clypeal apex; presence of smoothly convex longitudinal ridge extending from frons to vertex; glabrous with hardly any short tawny setae visible along baso-lateral margins, but heavily covered with dense round punctures across entire surface, becoming deeper and rugulose on sides of vertex; antennal club dark brown to black, as long as flagellum, pedicel and flagellum lighter brown with few medium-long tawny setae (Fig. 1 A, C, D).

Pronotum. Matte, dark green with testaceous-yellow lateral margins and brownish-rust inverse face pattern across

disc to basal and apical margins; remarkably round in shape, especially at basal and apical margins, lateral margins with anterior corner very round and posterior corner obtuse, widening progressively towards posterior corners; exhibiting poorly developed apical tubercle; glabrous, with few short setae only on lateral margins and with moderately dense round punctures across entire disc, becoming rugulose and more dense in apico-lateral region (Fig. 1 A).

Elytra. Matte with testaceous-brownish sub-umbonal external perimeter and dark green contour encircling almost entire surface above declivities, apart from narrow sutural area in apical third; longitudinal rust brown L-shaped band turning testaceous on pre-apical horizontal arm, joining the sutural region and meeting the inverse, symmetric L-band on opposite elytron to form combined U-shape; widest in umbonal region, with deep posthumeral arch posteriorly and then tapering gradually towards apex; apex with sharp spine at sutural margin; glabrous, with few short light setae scattered along lateral and posterior margins and declivities; with round to elongate punctures along striae, becoming geminate sculpture in apical third of striae 2 and 4 (Fig. 1A).

Scutellum. Isoscelic and markedly elongate longitudinally, with very pointed apex and virtually straight lateral margins; rust brown with lighter areas on disc; glabrous, without any visible macrosculpture across entire surface; lateral grooves relatively narrow but deep (Fig. 1A, C).

Pygidium. With dark green longitudinal central band extending towards lateral margins in basal half, but not reaching apex; central apical area and entire half of apical peri-lateral surface testaceous; with long, light tawny setae emerging regularly across surface except on baso-lateral green portions; entire surface covered in dense but shallow rugulose sculpture; smoothly rounded at apex and elongate at base; with shallow bilateral depressions on basal corners (Fig. 1 E).

Legs. Testaceous-reddish, with segment joints dark brown to black; protibia bidentate, with distal tooth longer and sharper than proximal, widening slightly posteriorly of proximal tooth; both mesotibia and metatibia without distinct outer denticles, with two pairs of short apical teeth and one pair of long and sharp spurs; all tibiae exhibiting dense but coarse sculpture and medium to long thick tawny setae across entire dorsal surface, except on protibial; first tarsomeres short, but tarsomeres 2-5 hypertrophic on meso- and metalegs (Fig. 1 A-C).

Venter. Shiny, black-coppery, with brown femora, mesosternal lobe and central portion of abdominal sternites 6-7; mesosternal lobe narrow but markedly elongate laterally, in shape of gently arcuate crescent, poorly projecting forward and with apical margin smoothly round; metasternal lobe flatish, wide and shiny, laterally constricted towards base, then expanded at centre and drastically constricted above post-mesocoxal sulcus, median sulcus moderately wide and visible only on anterior two-thirds;

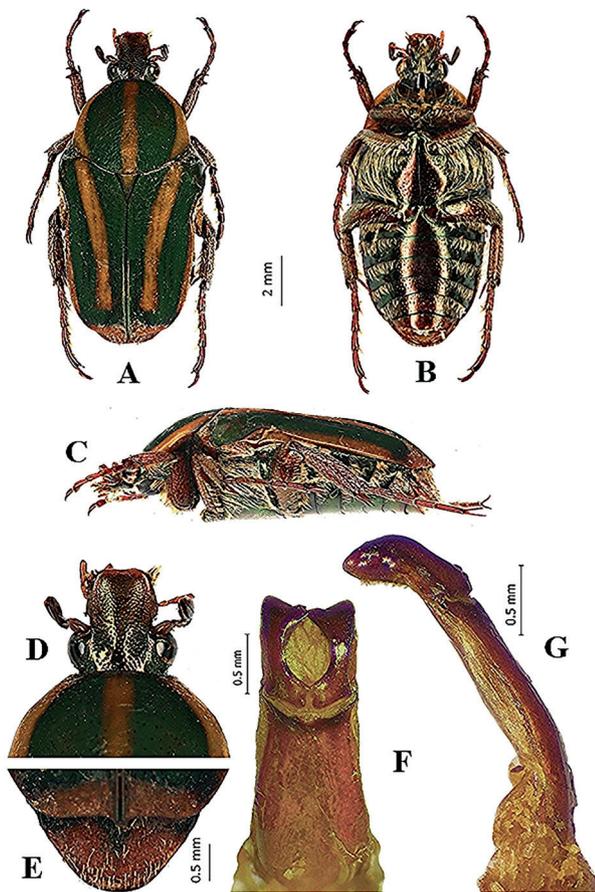


Fig. 2 – *Leucocelis (Amauroleucocelis) jeanneli* (Bourgoin, 1913) ♂: dorsal habitus (A); ventral habitus (B); lateral habitus (C); clypeus (D); pygidium (E); parameres, dorsal view (F); parameres, lateral view (G). Photos: A-E, Philippe Léonard; F-G, Berdien Daniels.

surface densely covered in long tawny setae on prosternum, metasternum, lower femoral surfaces and lateral parts of abdominal sternites, becoming shorter and more scattered on inner femoral surfaces and absent on meso-metasternal process and central parts of abdominal sternites; round punctures scattered on central shiny areas and femora, becoming rugulose on sides of metasternum and metacoxa, but absent on lateral margins of abdominal sternites (Fig. 1 B).

Aedeagus. With wide central cavity between parameres (dorsal view); internal lobes regularly developed with apical area markedly angulate; external lobes parallel, well-developed and extending way beyond apex of internal ones, forming smoothly rounded cones at apex; (Fig. 1 F); of typical *Leucocelina* shape in lateral view, with apical region smoothly rounded and asetose, but numerous, short setae protruding from ventral surface (Fig. 1 G).

Derivatio nominis. The species is named after Eric Vingerhoedt (La Réunion, France), who collected the first specimen in 2008.

Distribution. This species has so far been recorded only in Bugarama (Monge Forest Nature Reserve), Rumonge Province, Burundi (Fig. 3).

Data records. Type series – HT♂, **Burundi**: “Burundi, Bugarama, VII.2010, P. Léonard leg., *Leucocelis (Amauroleucocelis) vingerhoedti*, Ph. Antoine des. 2011” (RBINS); PTs: ♀, *ibidem* (PLEB); ♂, *ibidem*, “RW, IV-VI 2008, E. Vingerhoedt leg., *Leucocelis (Amauroleucocelis) jeanneli* (Bourgoin), Ph. Antoine det 2010” (PLEB); ♀, “Burundi, Rwegura, 8.VI.1986, G. Veronese, *Amauroleucocelis jeanneli* Bourgoin, Ph. Antoine det. 1991, Ex Collection Dr Vincent Allard, received from Christophe Allard 21.II.2015” (GBEG).

Remarks. The known specimens range in size from 10.5–11.3 mm in total length to 5.0–5.2 mm in maximum width. Three of the four specimens known thus far carry Antoine’s identification labels, with the first male attributed in 2010 to “*Leucocelis (Amauroleucocelis) jeanneli*”, but the pair collected later identified as “*Leucocelis (Amauroleucocelis) vingerhoedti*” in 2011. Presumably Antoine had at first regarded this new species as an extreme chromatic variation of *L. (A.) jeanneli*, but when further specimens eventually became available, he recognised the consistent differences in aedeagal parameres and other diagnostic characters between this and the latter species, designating both a male HT and a female PT (see “Data records” above).

The adult specimens were collected between April and July in open forest habitats (Fig. 4). They are presumably floricolous, although this cannot be established with confidence at this stage. All immature stages remain unknown.

***Leucocelis (Amauroleucocelis) jeanneli* (Bourgoin, 1913)** (Figs 2, 3, 5)

Amauroleucocelis jeanneli Bourgoin, 1913: 337; Schenckling 1921: 327; Krajcik 1998: 64.

Leucocelis (Amauroleucocelis) jeanneli. Antoine 2002: 87; Beinhundner 2017: 113.

Distribution. Currently known from highland areas (> 1700 m) of Kenya, Tanzania and Cameroon (Fig. 3), with a remarkable and yet unresolved apparent discontinuity between the East and West African localities (see also Discussion section below).

Data records. Type series – LT ♂ (des. Antoine 2002), **Kenya**: “Afr. Or. Angl., (Kikuyu Esc’) Kijabé, Dec 1911, 2100 m St 27, Alluud et Jeannel, *Amauroleucocelis jeanneli*, Bourgoin Type” (MNHN); PLT 1♂+1♀ (des. Antoine 2002), “Afrique or. Anglaise, M^e Kenya, vers^e Ouest, zone des forêts, forêts inf^{er}es (Podocarpus), 2400 m, Janv.-Fev. 1912 St 39, Alluud & Jeannel” (MNHN). Other records – **Cameroon**: 1♂+1♀, Nord-Ouest. Marc Desfontaine

leg. (MNHN); 1♂, “N-W, IX. 1998, Desfontaine leg., *Amauroleucocelis jeanneli* Bourg., Comparé aux syntypes, Ph. Antoine det. 1999” (GBEG); 1♀, *ibidem*, “*Leucocelis* (*Amauroleucocelis*) *jeanneli* Bourg., Ph. Antoine det. 2002” (GBEG); 1♂+1♀, “Mt. Cameroon, I.2002, J M Ngakeu leg.” (DMOU); 2♀, *ibidem*, “09.2003, coll. J. Mothia, (*Amauroleucocelis*) *jeanneli* (Bourgoin), det. G. Beinhundner 2005” (GBEG); **Kenya**: 1♂+1♀, Mt. Kenya, III.2014 (DMOU); 1♂, *ibidem*, Kimunye, Kerugoya, Castle Forest Lodge (PLEB); 3♂+1♀, *ibidem*, near Kimunye, 16-17.3.2014, leg. C. Vogt (GBEG); 2 inds, Aberdare Mountains, 00 23 27.7S 36 44 21.0E, 1 Feb 2004 (BMCS); 1♂, leg. Hovorka, Voem., (GBEG); 3♀, Thego Fishing Camp (Nyeri), 4-8.XII.1993, leg. Purlitzer, (GBEG); 2♂, Nandi Forest, IX.2010, leg. J. Omingo (GBEG); 1♀, Namanga HS, 1986, Ex Collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBEG); 1♀, Ngong 6000°, I.1980, Ex Collection Dr Vincent Allard, received from Christophe Allard, 21.II.2015; 1♀, Karura Forest, Nairobi Reg., 01-1985, P. Legrand leg. (TGMF); 2♂+1♀, *ibidem*, 05-1981, P. Juhel leg. (TGMF); 2♂, C. Gatamaiyu Forest, 02-2002, B. Le Ru leg. (TGMF); **Tanzania**: 1♀, Mweze for., Mpanda, Ex Collection Dr Vincent Allard, received from Christophe Allard, 21.II.2015 (GBEG); 1♀, *ibidem*, 1900 m, 19.4.1993, A. Bjørnstad 41967, J. Kielland leg. (PMBC).

Remarks. Specimens range in size from 10.5 to 14.0 mm in total length and from 6.0 to 8.0 mm in maximum width (Bourgoin 1913; Beinhundner 2017). Sexual dimorphism is extremely reduced in this species and restricted mainly to the metatibial spurs, which are shorter, thicker and less sharp in females by comparison with their male counterparts (Antoine 2002). The species is a high altitude forest dweller, probably restricted to Afrotropical vegetation dominated by *Podocarpus* spp. (Fig. 5).

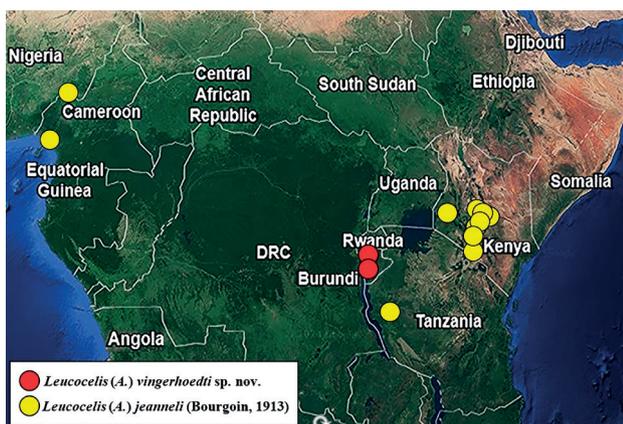


Fig. 3 – Known distribution range of *Leucocelis* (*Amauroleucocelis*) *vingerhoedti* sp. nov. and *L. (A.) jeanneli* (Bourgoin, 1913) within the central African region (Map: Google Earth with data from SIO, NOAA, U.S. Navy, NGA, GEBCO Landsat/Copernicus AfriGIS Pty Ltd IBCAO).

Discussion

Although originally described as a proper genus, with characteristics “intermediate between *Leucocelis* and *Discopeltis*” (Bourgoin 1913), *Amauroleucocelis* is currently recognised as a subgenus of the former and actually includes *Acheilosis* as its junior synonym (Antoine 2002). The two species subject of the present work do nevertheless exhibit some special features among the 28 between species and subspecies currently included in the subgenus. Both *L. (A.) jeanneli* and *L. (A.) vingerhoedti* have developed ornamental patterns on their pronotal and elytral disc, either in the shape of longitudinal to oblique yellow bands or more reticulated testaceous to rust-brown patterns, respectively. Conversely, the vast majority of the other taxa in the subgenus exhibit on their elytral disc either a uniform background colour often marked with scattered white dots [e.g. *L. (A.) septicollis* (Schaum, 1848), *L. (A.) lunicollis* (Kolbe, 1892)], or a juxta-sutural dark band [e.g. *L. (A.) decellei* (Ruter, 1969), *L. (A.) maraisi* (Antoine, 1987)]. The pronotal disc can however vary substantially among taxa and even within the same taxon [e.g. *L. (A.) lunata* (Reiche, 1849), *L. (A.) versicolora* (Moser, 1910)] and it is not unusual to observe symmetric darker spots and patches separated by a central band or wider area [e.g. *L. (A.) annae* (Burgeon, 1932), *L. (A.) cognata* (Harold, 1878)].

From an ecological point of view, perhaps the most interesting feature of the two species under scrutiny is that they both appear to be high-altitude dwellers, specialized to live in Afrotropical forest habitats. This is highlighted for instance in the labels accompanying the Mt Kenya type specimens, collected by Alluaud & Jeannel and used by Bourgoin (1913) in his description of *L. (A.) jeanneli*, where it is reported “Forêts Infères (Podocarpus), 2400 m”. Unfortunately, there are very few specimens in collections to elaborate more on this and provide further details on the ecology of either species, especially because their labels do not report any other information besides the usual locality, date and collector’s name. It is likely, however that, like for the vast majority of species in the same subgenus, adults of both species are floricolous. This is partly demonstrated in recent observations posted on the citizen science platform “iNaturalist” and made on 1 Sep 2023 at Naivasha, Kenya (<https://www.inaturalist.org/observations/181726879>). In the set of photos, a specimen of *L. (A.) jeanneli* is seen feeding on a white flower of an unidentified plant.

A major unresolved issue concerns the perceived biogeographic distribution of *L. (A.) jeanneli*, since unlike that of *L. (A.) vingerhoedti*, which is very restricted and coherent, spans a distance of over 2500 km from the mountain ranges of East Africa to Mt Cameroon in the west (Fig. 3). What makes this disjunct distribution rather suspicious is that there aren’t suitable mountain ranges between these two



Fig. 4 – Bugarama landscape, showing on the background typical forest habitats of *Leucocelis (Amauroleucocelis) vingerhoedti* sp. nov. (Photo: www.weathercrave.com/weather-forecast-burundi/city-34246/weather-forecast-bugarama-today; and: bi.geoview.info/bugarama,422937)



Fig. 5 – Western slopes of Mt Kenya with *Podocarpus* Afromontane forest representing the typical habitat of *Leucocelis (Amauroleucocelis) jeanneli* (Photo: www.mergili.at/worldimages/picture.php?/9900/categories)

extremes to provide connectivity and gene flow between the two populations. Also, the extraordinary taxonomic radiation observed within the genus indicates that speciation occurs rather rapidly once populations are separated by physical barriers. Antoine (2002) stated that the pair he examined from the North-West Cameroon region (presumably from Mt Bamenda or the broader Cameroon Volcanic Line) was not distinguishable from the typical form of East Africa (“*qui ne se distingue en rien de la forme typique*”). However, he did not specify which characters were considered in his analysis. Unfortunately, it was not possible on this occasion to undertake a close investigation of the Cameroonian specimens, but this should certainly be pursued going forward, possibly involving advanced techniques of DNA barcoding, as it is quite possible that they actually represent a distinct taxon already separated from *L. (A.) jeanneli*.

Acknowledgements. This work is dedicated to the memory of the late Philippe Antoine (1940 – 2017), a very prolific entomologist, with an extraordinary knowledge of the World Cetoniinae, especially those of the Afrotropical Region. Thanks to Antoine’s insight, the provisional identification of *L. (A.) vingerhoedti* was made before his passing, leading eventually the authors to undertake and complete this work. We are very grateful to the various

owners and curators of collections cited for loan of material and supply of specimen data and photos, especially Gerhard Beinhundner (Euerbach, Germany), Thierry Garnier (Montpellier, France) and Daniel Moore (Oro Valley, USA). Alain Drumont and Berdien Daniels of the Royal Belgian Institute of Natural Sciences (Bruxelles, Belgium) are thanked for providing high-resolution photos of the aedeagal parameres of the two species included in this work. The Nelson Mandela University (Gqeberha, South Africa) provided facilities and partial funding for the project.

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