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Lophorrhina garnieri, a new fruit chafer species from north-eastern Uganda (Coleoptera: Scarabaeidae, Cetoniinae)

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Abstract
A new species of *Lophorrhina* Westwood, 1842, *L. garnieri* sp. nov., was recently discovered in the Labwor Hills range of north-eastern Uganda and is here described. It differs substantially from its closest relative, *L. pentachordia* (Klug, 1835), particularly at the level of male clypeus but also in the aedeagal parameres, which show an expanded apical surface with lateral projections. In the male of the new species, the clypeus exhibits a smaller apical horn and a narrow and elongate frontal horn, which actually takes the shape of a tapering ridge, rather than a true laminar horn, as is the case in the male of *L. pentachordia*. Other major differences between the two species are manifested in the much more extensive light-yellow ornamentation that characterises the dorsal habitus of *L. garnieri* in comparison to *L. pentachordia* and the less protruding and angulate, rather than round, mesometasternal process exhibited by the new species. The female of *L. garnieri* remains unfortunately unknown. It is likely that the new species represents an isolated population that has remained separated from its relatives through events related to the formation of the East African Great Rift System and for a period long enough to result in speciation. The distribution of the species could potentially include partially connected ranges in western Kenya and South Sudan. In the process of investigating the relationship between this new species and its closest relative, it has also emerged that little information is currently available on the distribution range and biology/ecology of *L. pentachordia*. A comprehensive data record on its distribution range and period of activity is, therefore, provided here, along with basic information on its habitat preferences, adult diet and response to trapping methods.

Key words: Goliathini, new species, rainforest habitat, Afrotropical Region.

http://zoobank.org/urn:lsid:zoobank.org:pub:4132F6AC-83C5-4D48-B20F-26D7465FC46C

Introduction

The genus *Lophorrhina* Westwood, 1842 currently includes four other genera (*Chordodera* Burmeister, 1842; *Daedycorrhina* Bates, 1888; *Aphanesthes* Kolbe, 1892 and *Aphanochroa* Kolbe, 1893) that were synonymized by Krajcik in 1998. With particular reference to the "*Chordodera* group" features typical of the genus include: 1) clypeal horn upturned and truncated in male, drastically reduced and often dorsally sinuate in female; 2) presence of laminar frontal horn, truncated or elongate and tapering apically; 3) scutellum glabrous, isoscelic triangular in shape with width/height ratio ≤ 1; 4) protibiae tridentate in both sexes, narrow and with teeth reduced in male; 5) mesometasternal lobe dilated into a short, round process and protruding forward; 6) body deplanate, with pronotum virtually octagonal and elytra tapering towards apex; 7) parameres with dorsal lobes arcuate and exhibiting lateral expansion near apex (Westwood 1842; Burmeister 1842; Perissinotto et al. 2019).

Under *Chordodera*, two similar species with a broad distribution range within tropical Africa were recognised prior to the implementation of this synonymy, *Lophorrhina quinquelineata* (Fabricius, 1781) and *L. pentachordia* (Klug, 1835). A recent survey in the area of the Labwor Hills in north-eastern Uganda, sponsored by Dr Thierry Garnier during the spring of 2017, has revealed the existence of a third, undescribed species within this group, with morphological characteristics most closely related to those of *L. pentachordia.* In the process of searching for other potential records of this new species, either hidden in old collections or misidentified in previous studies, it has become apparent that very little knowledge is actually available to the broader scientific community about the full distribution range, habitat preferences and general biology/ecology of its closest relative. This work, therefore, provides a detailed description of the holotype male of the new species, along with a comprehensive data set on the biogeography and all other available information of its sister species, *L. pentachordia*.

Lophorrhina garnieri is thus the latest species to be added to this rather diverse genus, which now consists of 14 species and three subspecies, most of which are high altitude endemics of the East African mountainous region (Beinhundner 2017; Perissinotto et al. 2019). This corroborates the extraordinary diversity of cetoniine beetles already known from the Afrotropical region (excluding Madagascar), where 143 genera and more than 1000 species are currently recognised (Sakai & Nagai 1998; Beinhundner 2017; Perissinotto et al. 2019; Perissinotto 2020; De Palma & Malec 2020).

Materials & Methods

The male holotype of the new species was analysed from a loan kindly provided by Dr Thierry Garnier (Montpellier, France). Photos of the diagnostic areas of the external morphology of both species were taken with a Nikon CoolPix S9700 digital camera with macro setting and an Olympus E-M1 Mark iii camera provided with Raynox DCR-250 macro lenses adapted to Olympus m.ZD 40-150 R standard lenses and a Godox V860ii light flash system with diffuser. Photos of the male genitalia were obtained using a Nikon DigitalSight DS-Fi2 camera attached to a Nikon SMZ25 dissecting microscope. The background, pin-holes and other disturbances were removed from the photos using Microsoft Word 2010 (Picture Tools), in order to increase clarity and resolution of the images. The Combine ZP Image Stacking Software by Alan Hadley (alan@micropics.org.uk) was used to obtain z-stacking composite images.

As in previous work, the description of morphological characters of this study follows the terminology used by Krikken (1984) and Holm & Marais (1992). Specimen total length and maximum width were measured using a Vernier calliper, from the anterior margin of the clypeus to the apex of the pygidium and at the widest point of the elytra, respectively. Distribution and ecological data for *Lophorrhina penthacordia* were obtained from some major collections located in Africa, Europe and the USA. Complementary information on distribution, period of adult activity and other biological data were also obtained from the following literature sources: Fédière et al. (1989); Allard (1985); Sakai & Nagai (1998); Krajcik (1998); Mudge et al. (2012); Le Gall (2015); Beinhundner (2017) and Serrano et al. (2020). Research-grade observation records were also downloaded from the citizen science platform iNaturalist (http://www.inaturalist.org/). Within the text, records are accompanied by number and sex of individuals in front of each entry only when provided by the collection owners or curators, otherwise such details are omitted.

The following are the abbreviations used for public and private collections where specimens and records are reposited:

BMNH – Natural History Museum, London, United Kingdom
BMPC – Jonathan Ball and Andre Marais Private Collection, Cape Town, South Africa
DMPC – Daniel Moore Private Collection, Oro Valley, USA
FORI – National Forestry Resources Research Institute, Kifu, Uganda
GBPC – Gerhard Beinhundner Private Collection, Euerbach, Germany
JTPC – Julien Touroult Private Collection, Soyaux, France.
KNEM – National Museums of Kenya, Entomology Department, Nairobi, Kenya
PLPC – Philippe L**é**onard Private Collection, Embourg, Belgium
PMPC – Petr Malec Private Collection, Brno, Czech Republic
RBINS – Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium
TGPC – Thierry Garnier Private Collection, Montpellier, France
TMSA – Ditsong National Museum of Natural History, Pretoria, South Africa
ZMHB – Museum für Naturkunde der Humboldt Universität, Berlin, Germany

Taxonomy

***Lophorrhina garnieri* sp. nov.**

Diagnosis. This new species is most closely related to *Lophorrhina pentachordia*, from which it differs particularly at the level of male clypeus, but also in aedeagal parameres, extent of light-yellow ornamentation and shape of mesometasternal process (Figs 1-5). The male clypeus of *L. garnieri* exhibits a smaller apical horn and especially a narrower but more elongate frontal horn, in comparison with what is typically observed in *L. pentachordia* (Figs 2 A, 4 A). In fact, its frontal horn actually takes the shape of a tapering ridge, rather than a true laminar horn, as is the case in the male of *L. pentachordia*. In this respect, the male of *L. garnieri* actually resembles more the female of *L. pentachordia*, except that in the latter the clypeal horn is not only reduced in size by comparison with that of its male, but it also exhibits a deep dorsal indentation, imparting to its structure an effective bifurcate shape (Fig. 5 B). The pale-yellow ornamentation of *L. garnieri* is remarkably more developed that in any variety of *L. pentachordia*, both on its dorsal and ventral surfaces as well as on pygidium (Figs 1-5). Its mesometasternal process is less projected forward than in *L. pentachordia* and the shape of its anterior margin is also smoothly angulate, rather than perfectly rounded, as is the case in the

sister species. Finally, the aedeagal parameres of the new species show an expanded apical surface with enhanced lateral projections, by comparison with those of *L. pentachordia* (Figs 2 C-E, 4 C-E).

Description of holotype male (Figs 1 A-C, 2 A-E)
Size. Total Length = 21.2 mm; Maximum Width = 9.3 mm.
Body: Brown and matte, with darker areas along margins and on head as well as central part of elytral disc; pale-yellow ornamentation widespread across entire surface, with mid-scutellar line reaching almost apex and pronotal lines joint at base almost uninterruptedly; shallow and sparse, but wide round to horse-shoe sculpture covering virtually entire surface, with extremely short, light setae emerging at centre of most punctures; dense clusters of light, fine and long setae occurring on head and exposed parts of mesepimeron and metacoxa (Figs. 1 A, 2 A).

Head. Black becoming dark brown towards base; with deep concavities along lateral and apical margins, with clypeus broadly pentagonal and exhibiting sharply upturned, blunt horn at apex (Fig. 2 A); clypeo-lateral margins vertically declivous and joining frontal ridge dorsally; presence of prominent convexity at mid vertex, extending into a tapering tubercle on frons and ending with a sharply angulate but tiny horn, just posteriad of clypeal horn; clypeal surface covered in coarse dense punctures, becoming progressively more scattered and shallow on frons and fading on vertex; light-yellow tomentum and setae distributed along entire surface of lateral and apical concavities, except central area; antenna dark brown to black, with club as long as flagellum and pedicel combined; thin light setae scattered across flagellum, becoming thicker and denser on pedicel.

Pronotum. Brown with darker margins, matte and glabrous with five longitudinal tomentose lines across entire surface, forming transverse joints at base but interrupted above scutellum; marginal lines extending medially towards disc to form two symmetric eye-shaped figures (Fig. 1 A); shape broadly octagonal with lateral margins angulate at centre and both antero- and postero-lateral margins sharply rounded with pronounced angle; posterior margin slightly sinuate with smooth pre-scutellar arch.

Scutellum. Brown and matte, with mid and marginal tomentose lines almost completely uninterrupted, except small gaps towards apical point; exhibiting few, large but shallow horse-shoe punctures on disc, with tiny pale setae emerging at centre of each puncture; isoscelic triangular in shape with sharp apex; lateral grooves shallow and narrow (Fig. 1 A).

Elytron. Brown and matte, with two dark maculae on disc, at 1/3 and 2/3 distance from base respectively; densely ornamented with tomentose figures of irregular and often dotted shape, becoming particularly wide on lateral and apical declivities; first and fifth costae well-developed and raised across entire surface, but third costa fading posteriad of mid discal length; humeral and apical calluses prominent; sub-humeral arch with extremely weak sinuation and postero-lateral margins with fine serration; shallow horse-shoe punctures regularly spaced across entire surface, except on umbonal crests and costae; with extremely short and fine, light setae distributed along lateral and apical margins; apical margin abruptly rounded, with rough edge but without signs of proximal spines or protuberances (Fig. 1 A).

Pygidium. Broadly triangular in shape, with elongate base and round apex; slightly convex with small indentations along lateral margins; covered in pale-yellow tomentum, except on major central part and secondary symmetric lateral areas; with dense rugulose sculpture and short light setae scattered throughout surface (Fig. 2 B).

Legs. Black to dark brown and relatively long, with tarsal segments moderately elongate, particularly apical ones, being at least twice as long as preceding units; protibia tridentate, but with all teeth small and blunt, densely sculptured with mid longitudinal ridge and numerous short yellow setae on inner margin; meso- and metatibia with longer and denser pale-yellow setae, densely sculptured and with mid spine on outer carina sharply pointed to truncated, respectively; spurs moderately long, thin and sharp, approximately twice as long in metatibia than in mesotibia (Fig. 1 A-C).

Ventral surface. Black to dark brown and shiny where tomentum is absent; extensive tomentum cover over both sides of body, becoming scattered on femora and disappearing in

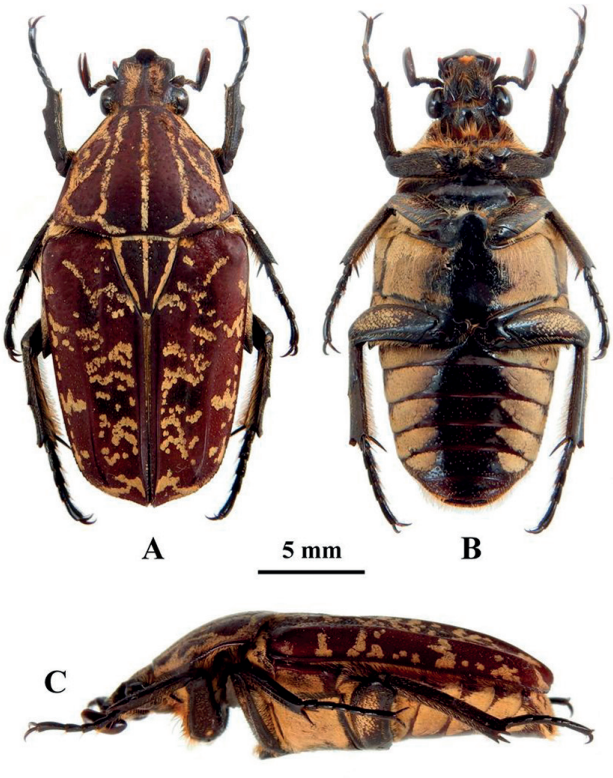

Fig. 1 – *Lophorrhina garnieri* **sp. nov.**, holotype male: **A**, dorsal habitus; **B**, ventral habitus; **C**, lateral habitus. Photographs by Lynette Clennell.

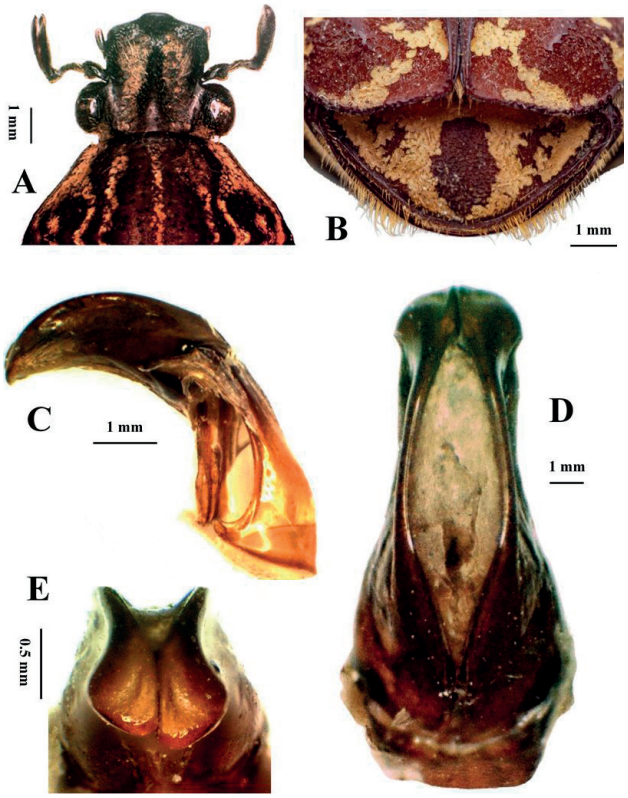

Fig. 2 – *Lophorrhina garnieri* **sp. nov.**, holotype male: **A**, clypeus; **B**, pygidium; **C**, parameres, lateral view; **D**, parameres, dorsal view; **E**, parameres, frontal view. Photographs: A, C-E, Lynette Clennell; B, Kit Chang.

central part of abdominal sternites, mesometasternal region and femoral bases; small, scattered and round to horseshoe sculpture visible across shiny surfaces, except mesosternal lobe; dense pubescence consisting of short to medium pale-yellow setae covering all tomentose areas as well as margins of femora and anal plate; mesosternal lobe ventrally flat, with angulate cuspid shape and poorly projecting anteriourly; abdominal sternites with shallow concavity at centre (Fig. 1 B-C).

Aedeagus. Parameres compact and of typical shape occurring within genus; dorsal lobes gradually tapering anteriorly and expanding then below apex to form hook-like protrusion on each side; apex smoothly rounded with small pair of symmetric indentations on side of central groove (Fig. 2 C-E); apical lobes exhibiting lateral expansion with smooth, glabrous margins all around (Fig. 2 D, E); ventral lobes slightly wider than dorsal lobes and emerging only below apex in dorsal view (Fig. 2 D).

Derivatio nominis. This species is named after Dr Thierry Garnier (Montpellier, France) who brought the holotype specimen to my attention, believing that it represented an undescribed taxon. Dr Garnier has made a remarkable contribution to the knowledge of African cetoniines and other beetles through his support for research in this area and his regular collecting expeditions to the continent.

Distribution. The male holotype was collected on the Labwor Hills, in the north-eastern highlands of Uganda (Fig. 5 C). These hills are characterized by tropical savanna forest with the highest elevation reaching approximately 1200 m (https://geoyp.com/56/labwor-hills-forest-3086003/). It is likely that the species also occurs in adjacent parts of Kenya and South Sudan, where there is some spatial connectivity with the Labwor Hills and similar habitat characteristics.

Type material. Holotype ♂: Ouganda N-E, Labwor Hills, Abim Dist., 05/2017, Mathias (local collector) leg. (TGPC).

Remarks. The only male specimen of *Lophorrhina garnieri* sp. nov. currently known was collected with a banana baited trap in tropical savanna forest habitat (T. Garnier, pers. comm.). Unfortunately, a worldwide search of the major collections has revealed that the female of this species remains unknown. The closest localities where its sister species *L. pentachordia* has been recorded so far are in the proximity of Lake Victoria, both in Uganda and in Tanzania. On the DRC side, several other records of *L. pentachordia* exist in the area between Lake Albert and Lake Kivu (Fig. 5 C). However, all these localities are at least 300-400 km to the south or to the west of the type locality of *L. garnieri* and it seems likely that the two species may have become separated by events related to the formation of the Great Rift System in East Africa.

Lophorrhina pentachordia (Klug, 1835)

Remarks. There is little information available on the biology of this and its related species. What appears from the data collected from specimen labels and collector communications is that adults are readily attracted into fruit baited traps, but there is no evidence yet that they may also visit flowers or sapping trees. The substances that have been used in the fruit traps range from mixtures of banana and palm wine (J. Touroult, pers. comm.), various combinations of banana, mango, papaya and pineapple to pure smoothies of applesauce (D. Moore, pers. comm.) or banana (label of specimen BMNH-NHMUK010600572; Mudge et al. 2012). One observation reports of a female specimen being attracted to a light traps at night (label of specimen BMNH-NHMUK010600636).

Some valuable information on its habitat type within Ghana was provided in the work of Mudge et al. (2012), highlighting an apparent restriction to Moist Evergreen and Guinea Savanna semi-deciduous forests. Rainer Wendt (https://www.inaturalist.org/observations/3514143) reported that in Guinea the species dwells “in dark shade of submontane rain forest”. This seems consistent with the habitat type described for its closest relative, *L. quinque-*

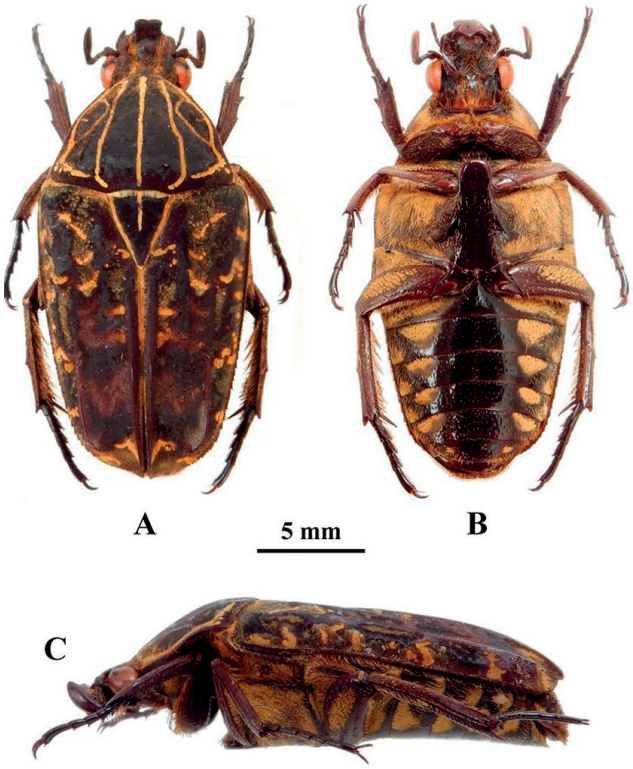

Fig. 3 – *Lophorrhina pentachordia* (Klug, 1835), male specimen: A, dorsal habitus; B, ventral habitus; C, lateral habitus. Photographs by Lynette Clennell.

lineata, in southern Benin, which apparently lives in the shady understorey of forest remnants, in contrast to many other sympatric cetoniine species that prefer tree canopies or sunny forest gaps (J. Touroult, pers. comm.).

Distribution. The range of this species has consistently been reported in a rather vague form, as stretching from the Ivory Coast to the eastern DRC (Kajcik 1998; Sakai & Nagai 1998; Beinhundner 2017). However, the current data search has revealed that its full range may actually extend much further, both to the east and to the west, to encompass the entire African tropical belt with the exception of the extreme East African portion. As the data records reported here below show, the species occurs at least in all the following countries (from west to east): Senegal, Gambia, Guinea, Ivory Coast, Ghana, Togo, Benin, São Tomé & Príncipe, Equatorial Guinea, Gabon, Cameroon, Burkina Faso, Central African Republic, Congo-Brazzaville, Congo-Kinshasa, Angola (?), Rwanda, Uganda and Tanzania. Serrano et al. (2020) reported the species with doubt from Angola, since they did not find any specimen during their survey and a previous record from the country by Paulino de Oliveira (1882) was reported under controversial identification. No records could be obtained from Nigeria, Liberia, Sierra Leone and Chad, but it is almost certain that the species occurs in all four countries, since they lie well within its potential range, and in the case of Nigeria actually right at the centre of its range.

Data records. Benin: Penessulu (Le Gall 2015); Niaouli (Le Gall 2015); Engaradebou (Le Gall 2015). **Burkina Faso:** 1♂, W-Afrika, Obervolta, Bobo-Dioulasso, 13.4.1980, Purlitzer leg., ex collection Richard Land sen., Florian Lang, Jun 2008; 1♀ idem 3.VIII.1979 (GBPC). **Cameroon:** 1♂, Isubu, 1193 Ex Musaeo J. Thomson, CE Tottenham Collection, B.M. 1969, 1193 *Chordodera pentachordia* Kl. (BMNH-NHMUK014400122); 1♂, ibidem, 1194 Ex Musaeo J. Thomson, CE Tottenham Collection, B.M. 1969-77, 1194 *Chordodera pentachordia* Kl. (BMNH-HMUK014400171); 1♂, ibidem, Bourgoin Coll., B.M. 1938-252 (BMNH-NHMUK014400153); 1♀, Kamerun, Buar. 10-29.v.1914 (BMNH-NHMUK014400160); 1♀, idem 1919-4 (BMNH-NHMUK014400162); 1♂+1♀, Kribi, xii 1990 (Sakai & Nagai 1998, p. 379); 3♂, Central Cameroun, Dec 1995 (BMPC); 2♀, Obout/Mbalmayo, XII 1997 (BMPC); 2♂+2♀, Buea, South-West Prov., XI.1999 (DMPC); 4♂+3♀, Nkolbisson, Center Prov. XI.1993, in applesauce baited trap, D. Moore leg. (DMPC); 1♀, Obout, Center Prov., XII.1993 (DMPC); 1♂+1♀, Koutaba, West Prov., X.2012 (DMPC); 2♀, Cameroun, coll. E. Candèze (RBINS); 1♂, Cameroun, coll. Thérot (RBINS); 1♂+2♀, Cameroun, Edéa (RBINS); 1♂+1♀, Ekonjo, petit Mt Cameroun, 800 m, XII.1990 (RBINS); 2♂, ibidem XII.1992 (RBINS); 2♂, Mungo (Douala, prov. littoral), XI/2006 (PMPC); 1♂+1♀, Mbalmayo, S from Yaoundé, II/1994 (PMPC); 1♂ Bamenda, NW Province, 12.2004, D. Fende leg. (GBPC); 1♂, Ebolowa, 7.6.1999, coll. Kath-Mission (GBPC); Mt Cameroon, 12.1991, leg. G Beinhundner (GBPC); 1♂, Ufon, 8.1993 (GBPC); Edea Region, P.K. 20, Sanaga maritime province, S. Cameroon, Dec 1990 & Feb 1989 (TGPC); Elogbatindi, South Cameroon, Feb. 1989 (TGPC). **Central African Republic:** 4♀, Haute Sangha, Carnot (RBINS); 2♀, Congo français, Fort Crampel (RBINS). **Congo (Brazzaville):** 1♂, Congo, Bourgoin Coll., B.M. 1938-252 (BMNH-NHMUK014400156); 1♀, Brazzaville, Fr. Congo W. Africa, E. Bourval Collector 1919-1920, ex Coll. F. Mason, Brit. Mus. 1922-173, determined from description GJA, *Chordodera pentachordia* Kl. (BMNH-NHMUK014400163); 1♂, ibidem, E. Bourval Collector 1919-1920, ex Coll. F. Mason, Brit. Mus. 1922-173, *C. pentachordia* Klug (BMNH-NHMUK014400166); 1♂, Rep. Pub. du Congo, Voka, iii/iv/v/vi 1978, G. Onore, BMNH(E) 2005-109 (BMNH-NHMUK014400182); 2♂, Dieli, Rivière Alima, 1895, coll. De Moffaerts (RBINS); 3♂+1♀, Congo republic,100 km N. Brazzaville, Lac bleu, XI.1989 (RBINS); 1♀, Dicome, 1.1991 (GBPC); 1♂+1♀, Voka, 5/10/2009, leg. E. Vingerhoedt (PLPC); 1♀, ibidem 3.1974, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC);1♂+2♀, Lesio-Louna, 10-20/10/2009, leg. E. Vingerhoedt (PLPC); 1♀, Ewo, 5.1979, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015

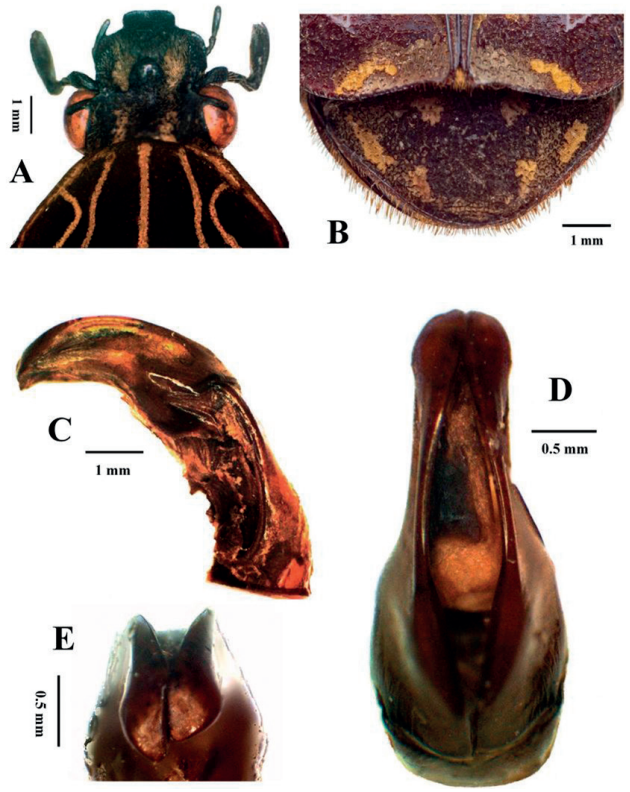

Fig. 4 – *Lophorrhina pentachordia* (Klug, 1835), male specimen: A, clypeus; B, pygidium; C, parameres, lateral view; D, parameres, dorsal view; E, parameres, frontal view. Photographs: A, C-E, Lynette Clennell; B, Kit Chang.

(GBPC). **Congo (Kinshasa):** 2♀, Mabenga, Mt Kasale 1000 m, XI.1934, Mission GF de Witte (RBINS); 1♀, Mabenga, Pied Kisali 1000 m, VI.1935, Mission GF de Witte (RBINS); 1♂ Mahagi (N-E DRC), V.2011 (DMPC); 1♂, Barumbu, VIII.1925, leg. J Ghesquière (RBINS); 1♂, haute Maringa, 1894-1896, L Mairesse (RBINS); 1♂, Manitasa, Ituri, 1971 (TMSA-CPH5867); 6♀, Kingantoko, Lac Tilapia, 1997, leg. C. Joly (PLPC, RBINS); 1♀, Kivu, Irangi, IV/V.1990, leg T. Bouyer (PLPC); 1♂, Nord Kivu, Kasuo, III.2010 (PLPC); 1♂, Kivu, Beni, 1982, leg. R. Ducarme (PLPC); 1♂, North Kivu Province, Kasuo, I.2012, coll. B Cavelius (GBPC); 1♀, Mambasa, Ituri, 15 Jan 2001, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC); n♀+n♂, Kasugho, N. Kivu, Mar 2014 (TGPC). **Equatorial Guinea:** 1♀+1♂, Bioko, I.1986, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC). **Gabon:** 22 inds, Ngounié, Mandji, Dibwangui long. 11,584, Lat. -2,115, 390 m, 18-26.II.2018, Poirier E. leg. TEREA AR0031/17 (JTPC, J. Touroult pers. comm.); 12 inds, Estuaire, Ngoulmendjim (Violaineville), Long. 10,565, Lat. 0,376, 415 m, 30.I-08.II.2018, Poirier E. leg., TEREA AR0031/17 (JTPC, J. Touroult pers. comm.); 1♂, Camp Nouna (Ivindo), Mar 2008, leg. G. Vande weghe (PLPC); 1♂, Ekouyi Bateke, XII.2007, leg. G. Vande weghe (PLPC); 1♂, Lonmin Camp (Mont de Cristal), Feb 2008, leg. G. Vande weghe (PLPC); 1♀, Vallée de ma Mbei, Tchimbele, 4.V.2013, leg. Ph Oreman (GBPC). **Gambia**: 1♂, Gambia, 1195 Ex Musaeo J Thomson, CE Tottenham Collection, B.M. 1969-77, 1195 *Chordodera pentachordia* Kl. (BMNH-NHMUK0 14400126); 1♂, idem 1196 (BMNH-NHMUK0 14400127); 1♀, idem 1198 (BMNH-NHMUK014400150); 1♂, idem 1197 (BMNH-NHMUK014400170). **Ghana**: Eastern Reg., Atewa Range For. Res., Sagyimase Trail, 300-800m, 20-22.X.2006, banana bait trap (GIP-1), A. Mudge (Mudge et al. 2012, p. 173); ibidem 21-23.X.2006 (GIP-6), A. Mudge (Mudge et al. 2012, p. 173); ibidem 22-24.X.2006 (GIP-7), A. Mudge (Mudge et al. 2012, p. 173); Volta Reg., Kyabobo Nat. Pk., vic. Laboum Outpost, N8º19.487´ E0º33.244´, 270 m, 20-23.VI.2007, Guinea savannah-farm-bush, banana trap (GIP-1), A. Mudge (Mudge et al. 2012, p. 173); Volta Region, vic. Amedzofe – Mt. Gemi, Oct 2006, ca. 786 m, (GIP-2), J Adams local coll. (Mudge et al. 2012, p. 173); ibidem N6º50.376'E0º25.854´, 786 m, 27-28.X.2006, banana bait trap (GIP-1), A. Mudge (Mudge et al. 2012, p. 173); Sagyimase, X.2003 (M. Gada-2) (Mudge et al. 2012, p. 173). **Guinea:** 1♀, Guinée (RBINS); 1♂, Guinée, Nevinson Coll. 1918-14, (BMNH-NHMUK014400164); 3♂+2♀, Guinée Forestière, Province de Yomou, Forêt classée de Diécké, Oct 2003, leg Ph. Leonard (PLPC); 2♂, ibidem 14-26/2/2003, leg Ph. Leonard (PLPC); 1♂, Fouta Djalon, 7 May 2014, in dark shade of submontane rain forest, Rainer Wendt (https://www.inaturalist.org/observations/3514143); 1♀, Nzerekore, I.1984, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC). **Ivory Coast:** 1♂, Cote d'Ivoire, Bourgoin Coll., B.M. 1938-252 (BMNH-NHMUK014400157); 1♂+1♀, Man (PMPC); Grand Béréby, IX.l985 (Fédière et al. 1989, p. 3); Azagny, III.1985 (Fédière et al. 1989, p. 3); ibidem X.1985 (Fédière et al. 1989, p. 3); Booro, XI.1986 (Fédière et al. 1989, p. 3); Tafiré, IX.1988 (Fédière et al. 1989, p. 3); 1♀, Man, IX.2009 (DMPC); Comoe NP, 238 m, Comoe 4, N08º42'55" W03º47'53", 27.vi – 2vii 2015, Open Forest, Banana Baited Bucket, leg. M. Aristophanous, P. Moretto & E. Ruzzier, BMNH(E) 2015-177 (BMNH-NHMU K010600572); 1♂, idem (BMNH-NHMUK010600573); 1♀, idem (BMNH-NHMUK010600574); 1♂, Mt Tonkoui Peak, 1171 m, 07º27'15.5"N 07º38'12.5"W, 01-08.xi.2015, General Coll, M. Aristophanous, P. Moretto & E. Ruzzier leg, BMNH(E) 2015-177 (BMNH-NHMUK012844783); 1♀, Tai NP, 174 m, Tai Research Station, 05º49'59.8"N 007º20'32.0"W, 14-23.xi.2015, Light Trap, M. Aristophanous, P. Moretto & E. Ruzzier leg, BMNH(E) 2016-109 (BMNH-NHMUK010600636); 2♂, Foret de Banco, coll. Gaiser (GBPC); 1♂, Alepe, leg. Gaiser, (GBPC). **Rwanda:** 3♂, Nr Goma, 12/2000, leg. J Weteshi (GBPC). **São Tomé & Príncipe:** Holotype ♀: Isle de Pr. [ince], Erman, *pentachordia* Klug*, 12579 (ZMHB). **Senegal:** 1♂, Senegambia (RBINS); 1♂+1♀, Senegal, env. Dakar, 1991 (RBINS). **Tanzania:** 1♂, Geita Forest Reserve, 1256 m, Geita, Mwanza Prov, xi.2011, S02º53'47" E32º08'08", leg. R. Smith & H. Takano, BMHN 2012-92, 1190910 (BMNH-NHMUK014400174); 1♂, idem 1190913

(BMNH-NHMUK014400175); 1♂, idem 1190909 (BMNH-NHMUK014400176); 1♀, idem 1190912 (BMNH-H MUK0 14400177); 1♂, idem 1190911 (BMNH-NHMUK014400178); 1♂, idem 1190914 (BMNH-HMUK01 4400179); 1♀, idem 1190918 (BMNH-NHMUK 014400180); 1♂, idem 1190917 (BMNH-HMUK014 400181); 1♀, idem 1190919 (BMN H-NHMUK014400 183); 1♂, idem 1190915 (BMNH-H MUK01 4400184); 1♀, idem 1190916 (BMNH-NH MUK0 14400185). **Togo**: 1♀, Forêt de Badou, XII.2015 (PLPC); 3♂+1♀, Kloto, Forêt de Missahoe, X.2020 (PLPC); 1♂, Kpalimé, 12.1994 (GBPC); 1♀, Gbalavé, 25.X.2012, leg. E Pekele (GBPC). **Uganda**: Kamego (Mpigi), X-1937 (KNEM); ibidem VIII-1949 (KNEM); Entebbe (Mpigi), VI-1914 (KNEM); Katera (Kiboga), XI-1933 (KNEM); Nagunga (Mukono), VIII-1913 (KNEM); Sango Bay (Rakai): XI-56; ibidem X-60; Mpanga Forest (Mpigi): IX-1959 (FORI); 1♀, Masaka, Katera Forest, Oct-Nov 1956, van Someren, VGL van Someren Collection, Brit. Mus. 1959-468 (BMNH-NHMUK014400123); 1♀, idem (BMNH-NHMUK014400125); 1♀, idem (BMNH-NHMUK014400167); 1♀, idem (BMNH-NHMUK0 14400169); 1♀, idem (BMNH-NHMUK014400173); 1♀, ibidem Nov 1955 (BMNH-NHMUK014400124); 1♀, idem (BMNH-NHMUK014400168); 1♀, idem (BMNH-NHMUK014400172); 1♀, ibidem CIE Coll. No. 15567, Pres by Com Inst Ent, BM 1960-3 (BMNH-NHMUK0 14400151); 1♀, idem (BMNH-NHMUK014400158); 1♀, idem, *Chordodera pentachordia* Kl., M.E. Bacchus det 1957 (BMNH-NHMUK014400165);1♂, ibidem Oct-Nov 1953, van Someren, Pres by Com Inst Ent, BM 1968-26, Com Inst Ent Coll No. 13508 (BMNH-NHMUK014400159); 1♀, Entebbe, 1973 (TMSA- CPH5866); 1♀, Katera, 11.1978, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC); 1♀, Kalinzu, 2.1972, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC); 1♀, Uganda, Ex collection Dr Vincent Allard, received from Christophe Allard 21.II.2015 (GBPC).

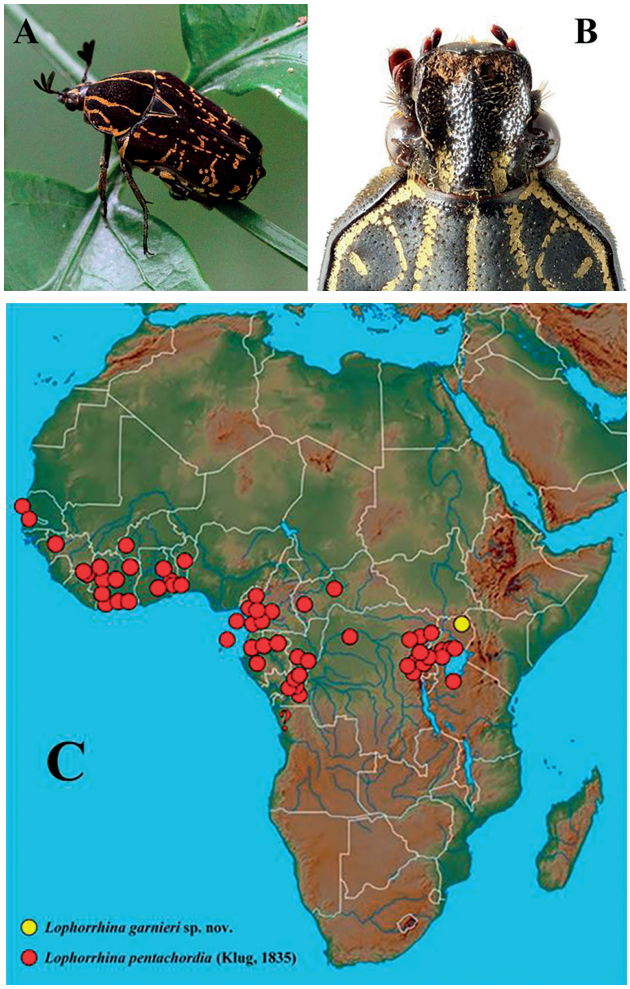

Fig. 5 – *Lophorrhina pentachordia* (Klug, 1835): A, male specimen in its natural habitat; B, typical female clypeus; C, distribution within the Afrotropical Region in relation to the type locality of the new species (map adapted from geology.com). Photographs: A, Reiner Wendt; B, Keita Matsumoto.

Discussion

Lophorrhina garnieri sp. nov. represents a new finding from an area that has been poorly investigated due to its remoteness from the major centres in the region. With its sister species, *L. pentachordia* and *L. quinquelineata*, the new species is part of a subgroup which used to be regarded as a separate genus, namely *Chordodera*, prior to its synonymization with *Lophorrhina* by Krajcik (1998). This genus now comprises 14 species and three subspecies, all of which except one [i.e. *L. pseudoincodes* (Kolbe, 1892)] occur in the region of the East African Great Rift Valley, with most of them actually being endemic to this area. Many other Cetoniinae species and even whole genera are also unique to this hotspot, such as: *Argyrophegges* Kraatz, 1895; *Conradtia* Kolbe, 1892; *Dicellachilus* Waterhouse, 1905; *Eutelesmus* Waterhouse, 1880; *Paleopragma* Thomson, 1880; *Priscorrhina* Krikken, 1984; *Trichoneptunides* Legrand, 2001 and *Pachytephraea* De Palma & Malec, 2020.

The new species likely represents an isolated population that has remained separated from the others, probably by events related to the formation and climatic dynamics of the East African Great Rift Valley, for a sufficient period of time to have speciated. In nearby Tanzania, the "*Daedycorrhina*" group of this genus has undergone an extraordinary radiation probably related to orographic and climatic events of a similar nature, with over ten between species and subspecies currently recognised from as many different mountain ranges within the south-eastern part of the valley (Sakai & Nagai 1998; Beinhundner 2017; Perissinotto et al. 2019). As reported in Perissinotto et al. (2019), a new related genus (*Lophorrhinides* Perissinotto, Clennell & Beinhundner, 2019) has also been recognised recently from the same broad region. Several phylogeographic studies conducted on a variety of organisms have

revealed an exceptional degree of genetic variation across the Great Rift Valley, showing that it has acted as a dispersal barrier for an extended period of time (Mairal et al. 2017). The Labwor Hills are situated in the so-called "Uganda Gap" within the broader area of the Eastern Afromontane Biodiversity Hotspot (EABH), and although not formally included within the boundaries of the hotspot itself, are clearly within the region characterized by this extraordinary genetic diversity.

The high level of endemicity found in the EABH has been explained by the high genetic exclusivity and restricted gene flow among mountain ranges occurring in the region of the Rift Valley. In the Great Lakes region of East Africa, the Rift System comprises two arcs, the Eastern Gregory Rift and the Western Albertine Rift, which converge towards the northern end of Lake Malawi (Ring 2014). The two arcs exhibit an array of so-called "sky islands", which include high plateaus and isolated mountain peaks separated by savannas and open forests (Mairal et al. 2017). The fundamental biodiversity patterns of the region are the result of a combination of topographic and ecological changes driven by geological rifting in eastern Africa. Additional impacts on its population genetic patterns are attributed to Pleistocene climatic changes, during which sky-islands would have acted as long-term refuges and cradles of genetic diversity (Mairal et al. 2017). Unfortunately, the extent of the Eastern African Afromontane Forest is rapidly shrinking due to a growing human population and its consequent demands on the natural resources of the region. Thus, there is an urgent need to escalate conservation studies and implement more effective management practices, in order to protect the high levels of exclusive and critically endangered biodiversity supported by the patches of Afromontane Forest that remain in this region.

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