Revision of the genus *Delopleurus* Boheman (Coleoptera: Scarabaeidae: Scarabaeinae) with description of new species from Africa

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The genus *Delopleurus* Erichson, 1847, is revised. Five new species are described from Africa: *Delopleurus naviauxi* sp. nov., *Delopleurus krikkeni* sp. nov., *Delopleurus darrenmanni* sp. nov., *Delopleurus fossatus* sp. nov. and *Delopleurus pubescens* sp. nov. One new synonymy is established (*Delopleurus parvus* (Sharp, 1875) = *Delopleurus cardoni* Paulian, 1934, syn. nov.). Lectotype of *Delopleurus pullus* Boheman, 1857, is designated. *Delopleurus janssensi* Frey, 1963, is transferred to the genus *Metacatharsius* Paulian, 1939. A key to the *Delopleurus* species and locality maps are given.

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**Keywords:** Coleoptera; Scarabaeidae; *Delopleurus*; new species; new synonymy; new combination; key to species; Africa-Southern Asia disjunction; mycetophagy

**Introduction**

This paper is the last in a series of taxonomic revisions of the peculiar scarabaeine ‘dung beetles’ of the *Sarophorus* group of genera (*Sarophorus* Erichson, *Frankenbergerius* Balthasar, *Coptorhina* Hope, and *Delopleurus* Erichson). This group was first recognized by Erichson (1847) who noted the sinuate epipleura (strongly in *Coptorhina* Hope and *Delopleurus* Erichson and not so strongly in *Sarophorus* Erichson) and correspondingly widened metepisterna. Later the status and position of *Frankenbergerius* Balthasar within the group was validated (Frolov and Scholtz 2005) and other characters shared by the members of the group were found (Frolov 2003; Frolov and Scholtz 2005; Frolov et al. 2008).

*Delopleurus* comprises superficially similar, small-sized, dark brown to black, strongly convex beetles distributed in Africa south of the Sahara and in southern Asia. The genus is commonly classed as dung beetles; however, there is no evidence of its association with dung. Available data suggest that the beetles are associated with higher fungi similar to the related genus *Coptorhina*, members of which are obligate feeders on basidiomycetes (Frolov et al. 2008). *Delopleurus* is also peculiar in having a disjunctive range including most of the Afrotropical Region and Indian Peninsula. Distribution of the other genera of *Sarophorus* group is limited to the Afrotropical region.

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Of the four genera of the *Sarophorus* group, *Delopleurus* is the rarest in collections. This may indicate that the beetles have a highly cryptic life style and short mating period and depend on highly ephemeral and patchy food resources (mushrooms). It is however possible that some species may be locally common, as can be seen from a reasonable series of *Delopleurus darrenmanni* sp. nov. collected in Caprivi Park Nova (Namibia).

Before the present contribution, *Delopleurus* comprised six nominal species, three described from Africa and three from Asia (Gillet 1911; Janssens 1939; Ferreira 1972; Davis et al. 2008). Examination of the material accumulated in museums after the last taxonomic works on the group showed that the characters used by the previous workers are not sufficient to separate species. Other characters, especially the sculpture of the pygidium, suggested that there are nine species of *Delopleurus* in the available material, five of which were not yet described. This necessitated examination of the type specimens of all nominal species and a revision of the genus.

**Material and methods**

The study is based on the material housed in the following institutions:

| Institution   | Location                          |
|---------------|-----------------------------------|
| BMNH          | The Natural History Museum, London, |
| DMAGD         | Durban Museum and Art Gallery, Durban, |
| IRSNB         | Institut Royal des Sciences Naturelles de Belgique, Brussels, |
| MNHN          | Muséum National d’Histoire Naturelle, Paris, |
| MRAC          | Musée Royal de l’Afrique Centrale, Tervuren, |
| NHMB          | Naturhistorisches Museum, Basel, |
| NHRS          | Naturhistoriska Riksmuseet, Stockholm, |
| OUMNH         | University Museum, Oxford, |
| SAMC          | South African Museum, Cape Town, |
| SANC          | National Collection of Insects, Plant Protection Research Institute, Pretoria, |
| TMSA          | Ditsong National Museum of Natural history (formerly Transvaal Museum), Pretoria, |
| UPSA          | University of Pretoria Insect Collection, Pretoria, |
| ZIN           | Zoological Institute of Russian Academy of Sciences, St Petersburg. |

Preparation of specimens follows the common technique used in entomological research. Photographs were taken with a Leica MZ9.5 stereo microscope and a Leica DFC290 digital camera from dry specimens except for aedeagi and internal sacs, which were photographed in glycerol. Partially focused serial images were combined in Helicon Focus software (Helicon Soft Ltd., Kharkov, Ukraine) to produce completely focused images. Distribution maps were prepared with ArcGIS software (ESRI Inc., Redlands, CA, USA). As a base map, terrestrial ecoregions of the world map (Olson et al. 2001) was used. Co-ordinates of the localities were taken from the specimen labels, if available, or from the NGA GEOnet Names Server (GNS, [http://earth-info.nga.mil/gns/html/index.html](http://earth-info.nga.mil/gns/html/index.html)). For descriptive purposes, three parts of the pygidium are recognized: basal border, apical border and disc (Figure 2B, E).
Type species: D. pullus Boheman 1857. 

*Delopleurus* was established by Erichson (1847) for ‘one small south African species, which differs from *Coptorhina* in narrower hind legs’. Ten years later Boheman (1857) gave the name to this species, *D. pullus*, and so fixed the type species of the genus. Sharp (1876) described *Coptorhina parva* from northern India. Arrow (1931) moved *C.parva* to *Delopleurus* and described the second species from India, *D.striatus*. Paulian (1934) described the third species from India, *D. cardoni*. Janssens (1939) described the second species from Africa, *D. gilleti*, and gave a diagnostic key to all species known by then. Frey (1963) described *D. janssensi* from Ethiopia. Except for this primary taxonomic literature, members of the genus were listed in the catalogues and monographs (Péringuey 1901; Gillet 1911; Balthasar 1963; Ferreira 1972; Král and Löbl 2006; Davis et al. 2008) but few additional data were given.

**Diagnosis**

*Delopleurus* and closely related *Coptorhina* share somewhat rectangular metepisternum, widest in its hind part, very convex epipleural margin (Figure 1A), and other taxonomic characters of the *Sarophorus* group of genera (Frolov et al. 2008). From *Coptorhina* it can easily be separated by quadridentate clypeus and smaller body size (3.5–6.1 mm in *Delopleurus* and 8.0–20.0 mm in *Coptorhina*).

**Description**

Beetles are small (3.5–6.1 mm), strongly convex, black or dark brown, glabrous. Clypeus distinctly quadridentate in most species. Two medial teeth are almost always acute, lateral ones are acute to right-angled. In some species, lateral clypeal teeth are almost not separated from the lateral margin (Figure 7A, D). Head without carinae on disc, and lacking horns or tubercles. Small carina present near inner

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Figure 1. *Delopleurus* spp. (A) *D. fossatus* sp. nov., lateral view of body (sinuate epipleuron is arrowed); (B–D) anterior tibiae: (B) *D. pullus*, male; (C) *D. pullus*, female; (D) *D.naviauxi*, female, holotype).
margin of eye. Genae right-angled, indistinctly separated from clypeus. Frontoclypeal and genal sutures almost indistinct. Eyes small, their dorsal parts small, slit-shaped in some species, ventral parts larger, sub-rectangular. Distance between eye and gula approximately twice the width of eye in ventral view. Gula with longitudinal groove (Figure 9F). Dorsal surface of clypeus rugose in most species, frons densely punctate to rugose.

Pronotum more or less trapezoidal, about two times wider than long. Anterior and lateral margins with distinct border, base with or without border. Pronotum is not excavated, without horns or ridges but with fine short longitudinal groove basally along the midline.

Elytra trapezoidal, as wide as long, shiny to opaque, with deep sinuation on lateral margins receiving convex metepisternum (Figure 1A). Striae fine but distinct,
punctate; striae 1–7 reach base of elytron, stria 8 reaches the sinuation but not the base; striae 9–10 are very close to epipleura and mostly inseparable from each other except apically. Elytral intervals flat to convex, with minute punctation. Elytra fused along suture. Scutellum not visible from above.

Figure 3. *Delopleurus pullus*. (A, D) habitus (A, male, D, female); (B, E) pygidium (B, male, E, female); (C) aedeagus in lateral view and internal sac; (F) locality map.
Wings well developed and feature a number of characters that *Delopleurus* share with species of the *Sarophorus* group of genera (Frolov et al. 2008): brown colour except for very basal part, reduced anal area (veins J and AP$_{3+4}$ are absent), CuA widened apically along the wing margin, RA$_4$ does not reach the wing margin and becomes wide and indistinct apically.

Anterior tibiae have three outer teeth. Margin basad of third tooth feebly or not serrate. Spur of anterior tibia more or less bifurcated in males and apically acute to rounded and curved inwards in females. In one species (*D. naviauxi* sp. nov.), anterior

Figure 4. *Delopleurus darrenmannii* sp. nov. (A, D) habitus (A, male, D, female); (B, E) pygidium (B, male, E, female); (C) aedeagus in lateral view and internal sac; (F) locality map.
tibia with one small acute tooth between first outer tooth and spur (Figure 1D). Outer margins of middle and posterior tibiae without transverse carinae, serrate. Tarsi of all legs well developed, shorter than tibiae. Claws about half the length of fifth tarsal segment.

Pygidium about twice as wide as long, its sculpture is species-specific and, in some species, differs strongly from that in the other scarabaeine taxa. In some Delopleurus species basal and apical borders are relatively narrow and the disc occupies most of pygidium (Figure 2E). In others, however, the borders are much wider and the disc is almost slit-shaped (Figure 2B). Sculpture of pygidium is sex-dependent in some species.

Aedeagus of typical scarabaeine shape (Figures 2F, 3C, 4C, 5C, 6C, 7C, 8C). Phallobase with two symmetrical tubercles. Parameres symmetrical, without setae apically, slightly distinctive in different species. Internal sac with armature consisting of a few sclerites of complex shape.

Sexual dimorphism
Males can be easily separated from females by having more or less bifurcated spurs of anterior tibiae (Figure 1B, C). Some species differ strongly in the sculpture of the pygidium.

Diagnostic characters
Unlike other scarabaeines, Delopleurus species can be best separated by the sculpture of the pygidium. Although shape of the parameres and internal sac armature shows some species specific features, they are not considered reliable diagnostic characters. However, availability of the other characters, especially that of the pygidium, makes dissection unnecessary in routine identification.

Distribution
Delopleurus has a disjunctive range covering most of the Afrotropical Region and Indian Peninsula. The ranges of species are rather limited (except for D. gilleti Janssens) although this may be a result of undersampling. Two regional faunas, Afrotropical and Indian, share no common species, which may indicate that they have long developed in isolation. The genus range disjunction can be best explained by the contraction of a previously very large range since the late Neogene. It is possible that in the late Miocene, when huge regions of Africa and Eurasia, including the territories of the present-day Sahara and Mediterranean, were covered by the African-type savannas, Delopleurus was widely distributed in the Eurasia. No palaeontological data exist on the past occurrence of Delopleurus in Europe and extratropical Asia, but considering very low taphonomic potential of these soil dwellers, discovery of any fossil Delopleurus seems highly improbable.

Biology
Little information is available about the biology of Delopleurus and the immature stages of the genus are unknown. In Ivory Coast, a few specimens of D. gilleti were
collected on mushrooms of *Termitomyces* cf. *schimperi* along with more numerous *Coptorhina nitidipennis* Boheman (Yves Cambefort, pers. comm.). In Namibia (Caprivi, Darren Mann, pers. comm.), beetles of *D. darrenmanni* sp. nov. were collected in mushrooms (*Termitomyces* sp.) on and around termite mounds, also in association with *Coptorhina* (*C. nitidipennis* and *C. angolensis* Arrow). There were

Figure 5. *Delopleurus gilleti*. (A, D) habitus (A, male, D, female); (B, E) pygidium (B, male, E, female); (C) aedeagus in lateral view and internal sac; (F) locality map.
apparently *Coptorhina* burrows under the fungal umbrella or a few centimetres away. No smaller burrows of *Delopleurus* were seen however. It is possible that *Delopleurus* can use mushroom pieces buried by *Coptorhina*.

*Delopleurus* beetles have never been found in or under dung pads, and they have never been collected by pitfalls baited with dung or carrion [Philippe Walter collected a few specimens in traps baited with fish (Yves Cambefort, pers. comm.) but these were most probably chance captures].

Available data suggest that *Delopleurus* are specialist feeders of agaric mushrooms (Agaricales). They seem to be associated with the termitophilous genus *Termitomyces*, a widespread fungal genus with large fruit bodies. In the case of *Delopleurus* and *Coptorhina*, feeding on mushrooms can be a secondary adaptation from the putatively generalist saprophagy of their ancestors. Feeding on mushrooms as an adaptation to arid biotopes in beetles was hypothesized by Striganova (1980).

All *Delopleurus* specimens examined have well developed wings and apparently are good fliers. But no specimens have been collected at light, according to the labels and data from collectors. This, along with small eyes (typical for all members of the *Sarophorus* group genera), suggests that the beetles have diurnal flight activity.

**Key to *Delopleurus* species**

*Males*

1. Disc of pygidium more or less densely punctate (Figures 3B, 4B, 5B) or granulate with short brown setae (Figure 2E). Species from Africa ........................................... 2
2. Disc of pygidium almost smooth, without setae (Figure 8B). Species from Asia ...

.................................................................................................................................................. *D. parvus*
2. Disc of pygidium rugose and with sparse brown setae (Figure 2E) .......................................................... D. pubescens sp. nov.
Disc of pygidium with different sculpture, without setae. ........................................ 3

3. Border of pygidium relatively narrow; punctuation of pygidium disc sparser (Figure 3B) .......................................................... D. pullus
Border of pygidium thicker (Figures 4B, 6B, 7B), if similar to *D. pullus* then punctation of pygidium disc coarser (Figure 5B) ................................. 4

4. Disc of pygidium almost as long as apical border (Figure 4B) ..............................
.............................................................................................................. *D. darrenmanni* sp. nov.
Disc of pygidium 1.5–2 times longer than apical border ................................. 5

Figure 8. *Delopleurus parvus*. (A, D) habitus (A, male, D, female); (B, E) pygidium (B, male, E, female); (C) aedeagus in lateral view and internal sac; (F) locality map.
5. Disc of pygidium feebly convex, almost in plane with basal border (in lateral view, Figure 5B) ................................................................. 5D. gilleti
Disc of pygidium strongly convex, distinctly separated from basal border by a deep hollow (in lateral view, Figure 6B, 7B) .................................................. 6

6. Elytra with well-developed humeral umbones, sinuate behind umbones in dorsal view (Figure 6A). Basal border of pygidium strongly widened medially (Figure 6B) ......................................................... 6D. krikkeni sp. nov.
Elytra with feebly developed humeral umbones, feebly or not sinuate behind umbones in dorsal view (Figure 7A). Basal border of pygidium slightly widened medially (Figure 7B) ......................................................... 7D. fossatus sp. nov.

**Females**

1. Disc of pygidium more or less densely punctate, or slit-shaped, or granulate (with short brown setae). Species from Africa ................................................................. 2
Disc of pygidium almost smooth (Figure 8E) or granulate, without setae (Figure 9C). Species from Asia ................................................................. 7
2. Fore tibia with small acute tooth near apical spur (Figure 1D). Pygidium with slit-shaped pubescent disc (Figure 2B) ........................................ D. naviauxi sp. nov. 

Fore tibia without tooth near apical spur (Figure 1C). Sculpture of pygidium different; if disc of pygidium slit-shaped then it lacks setation (Figure 4E) ........................................ D. pullus

Borders of pygidium relatively wide, disc without setation  ........................................ D. darrenmanni sp. nov.

3. Borders of pygidium relatively narrow; disc feebly convex, granulate and pubescent (Figure 3E) ........................................ D. pullus

Borders of pygidium relatively wide, disc without setation  ........................................ D. darrenmanni sp. nov.

4. Disc of pygidium slit-shaped, with transverse carina (Figure 4E) ........................................ D. darrenmanni sp. nov.

Disc of pygidium 1.5–2 times longer than apical border thickness  ........................................ D. pullus

5. Disc of pygidium feebly convex, almost in plane with basal border (in lateral view, Figure 5E) ........................................ D. gilleti

Disc of pygidium strongly convex, distinctly separated from basal border by a deep hollow (in lateral view, Figure 7E) ........................................ D. fossatus sp. nov.

6. Elytral striae with larger punctures (Figure 8D). Disc of pygidium smooth to indistinctly rugose (Figure 8E) ........................................ D. parvus

Elytral striae with smaller punctures (Figure 9A). Disc of pygidium granulate (Figure 9C) ........................................ D. striatus

Delopleurus naviauxi Frolov et Cambefort, sp. nov. (Figures 1D, 2A–C)

Diagnosis

This species can be separated from other Delopleurus species by having deep transverse fossa on the pygidium and by the fore tibia with a small acute tooth near apical spur.

Description

Holotype, female. Body strongly convex, black, glabrous, length 4.9 mm (Figure 2A).

Clypeus quadri dentate. All four clypeal teeth acute, two medial ones relatively slender. Head without carinae on disc, small carinae present near inner margin of eyes. Genae right-angled, indistinctly separated from clypeus. Frontoclypeal and genal suturae indistinct. Eyes small, their dorsal parts slit-shaped, ventral parts sub-rectangular. Clypeus rugose in anterior part and laterally, frons densely punctate with elongate punctures.

Pronotum trapezoidal, about two times wider than long. Anterior and lateral margins bordered, base without border. Pronotum relatively densely punctate on disc (punctures separated by one to two puncture diameters), punctation becoming denser laterally.

Elytra trapezoidal, as wide as long, shiny. Striae distinct, with punctures larger than striae. Elytral intervals slightly convex on disc, with minute punctation.

Anterior tibiae with three outer teeth and a small acute tooth between first outer tooth and apical spur (Figure 1D).

Pygidium with deep transversal slit-shaped fossa with yellowish setae (Figure 2B).
Paratype. female, slightly larger than the holotype (6.0 mm). The specimen has malformed or worn, reduced anterior tibiae without outer teeth and tarsi, and reduced clypeal teeth. It also differs from the holotype in having less shiny dorsal side.

Male unknown.

Type material
Holotype, female with the labels ‘Kenya Colony Makuyu iii-v 1937 C.D.Knight’, ‘Imp. Inst. Entom.’ (BMNH) and paratype, female with the labels ‘Kenya Maji ya Chumvi 30.4.78 R.N.’, ‘coll. R. Naviaux’, ‘Delopleurus n. sp? Y.Cambefort det’ (MNHN).

Distribution
The species is known from two localities in Northern Acacia-Commiphora bushlands and thickets ecoregion in East Africa (Figure 2C).

Etymology
The species is named after Roger Naviaux, a French collector.

Remarks
Yves Cambefort (MNHN) examined the Delopleurus specimen from Maji ya Chumvi in the 1980s and noted that it was distinct from other described species of this genus. However, he did not describe it at that time. In the course of the revision of the genus, I examined the specimen from Makuyu which is housed in the BMNH. After comparison of the two specimens we concluded that they are conspecific and belong to a new species described above.

Delopleurus pubescens Frolov, sp. nov.  
(Figure 2D–G)

Diagnosis
Males of this species can be separated from other Delopleurus species by the disc of pygidium being rugose, somewhat granulate and pubescent with sparse brown setae (Figure 2E). Such a sculpture is similar to that of females of D. pullus (Figure 3E) but it is not rugose in the latter.

Description
Holotype, male. Body strongly convex, black, glabrous, length 5.0 mm (Figure 2D). Clypeus quadritentate, two medial teeth are acute, lateral ones are somewhat angulate. Genae right-angled, indistinctly separated from clypeus. Frontoclypeal and
genal suturae almost indistinct. Clypeus rugose in anterior part and laterally, frons densely punctate (punctures separated by about one puncture diameter).

Pronotum more or less trapezoidal, about two times wider than long. All margins with distinct border. Disc and base punctate with punctures separated by two to three puncture diameters, sides and especially anterior angles more densely punctate.

Elytra trapezoidal, as wide as long, somewhat opaque. Stria deep, with punctures slightly larger than striae width. Elytral intervals slightly convex (more distinctly on disc).

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur.

Pygidium with relatively slender borders and convex disc. Basal border slender and almost parallel-sided except in the middle. Apical border about twice as thick in the middle as the basal border, becoming more slender laterally. Disc with irregular, rugose and granulate sculpture, pubescent with short yellowish setae (Figure 2E).

Parameres with a small protuberance ventroapically (visible in lateral view, Figure 2F).

Female unknown.

Paratypes. Body length 4.3–5.5 mm.

Distribution
The species is known from a few localities in the Congolese forest-savanna and Miombo woodlands (Figure 2G).

Etymology
The species name is a Latin word denoting the peculiar sculpture of the pygidium.

Type material
Holotype, male with the label ‘Salisbury Mashonaland Feb. 1906 G.A.Marshall’ (BMNH). Paratypes: 3 males with the same label as the holotype (BMNH); 1 male with the label ‘Salisbury Mashonaland G.A.Marshall 189[4]’ (SAMC); 2 males with the labels ‘COLL. MUS. CONGO Mayidi – 1945 R. P.Van Eyen’ (MRAC); 1 male with the label ‘Musee du Congo Lulu: r. Kapelekese 17.XI.1933 G.F.Overlaet’ (MRAC); 1 male with the label ‘Coll. I.R.Sc.N.B. Rhodesie du Sud Salisbury Dec. 1900 G.A.K.Marshall Coll. J.J.Gillet’ (IRSNB); 1 male with the label ‘Salisbury 14/1/15’ (DMAGD).

*Delopleurus pullus* Boheman
(Figure 3A–F)

*Delopleurus pullus* Boheman 1857; Péringuey 1901; Ferreira 1972; Gillet 1911; Janssens 1939.
Diagnosis
This species is most similar to *D. gilleti* but can be separated from it in having the pygidium with relatively larger disc punctate with smaller and sparser punctures in males and granulate and pubescent in females, and in having relatively sparsely punctate disc of pronotum.

Description
Beetles are small (4.5–6.1 mm), strongly convex, black or dark brown, upper surface glabrous.

Male (Figure 3A). Clypeus quadridentate, two medial teeth acute, lateral ones right-angled to acute-angled. Clypeus rugose in anterior part and laterally, frons densely punctate (punctures separated by less than a puncture diameter).

Pronotum more or less trapezoidal, about two times wider than long. Anterior and lateral margins bordered, base not bordered. Surface relatively sparsely punctate on disc (punctures separated by two to three puncture diameters) and denser laterally.

Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures slightly larger than striae width. Elytral intervals feebly convex to almost flat, with minute punctation.

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur.

Pygidium with relatively slender borders and convex disc. Basal border slender and almost parallel-sided except in the middle. Apical border about twice as thick in the middle as the basal border, becoming more slender laterally. Disc glabrous, punctate with punctures separated by one to two puncture diameters (Figure 3B).

Parameres with a small protrusion ventroapically (visible in lateral view, Figure 3C).

Female (Figure 3D) can be separated from male in having acute, not bifurcated spurs of anterior tibiae and disc of pygidium with small granules and setae (Figure 3E).

Type material
Lectotype (here designated), male with the labels ‘Caffraria’, ‘J. Wahlb[erg]’, ‘Type’, ‘pullus Boh. det J.Ferrer’ (NHRS). Paralectotypes, male and female with the labels ‘Caffraria’, ‘J. Wahlb[erg]’ (NHRS).

Additional material
ANGOLA: Namakunde, II.1923, 1 male, 2 females (SAMC). ZIMBABWE: Mutare [Umtali], 1903, A.Bodong leg., 1 male (SAMC); Empandeni, 1911, J.O’Neil leg., 2 males, 2 females (SAMC); Salisbury, 1894, G.A.Marshall leg., 3 males (SAMC); Salisbury, XII.1897, G.A.Marshall leg., 1 male (BMNH); Salisbury, XII.1900, G.A.K.Marshall leg., 1 male (IRSNB); 7 miles (11.3 km) south of Matimba, 5.I.1972, Bornemissza & Kirk leg., 1 male (SANC); Bulawayo, XII.1903, G.A.K.Marshall leg.,
1 female (BMNH). NAMIBIA: Otjiwarongo district, Abachaus, XII.1951, G. Hobohm leg., 1 male (TMSA); Otjiwarongo district, Abachaus, 16.I.1956, G. Hobohm leg., 1 male, 2 females (NHMB); Kamanyab [Kamanjab], 1 male, 4 females (SAMC); Mafa, II.1923, 2 females (SAMC); Nagusib [Farm 25 southeast Namutoni], I.1922, 1 spm. (SAMC); Kaokoveld, 44 km northwest Ohopoho, 7.II.1975, from under stones, leg. Endrody-Younga leg., 2 females (TMSA). MOZAMBIQUE: Chimoio, XII.1929, P.Lesne leg., 2 females (MNHN). SOUTH AFRICA: D’Nyala Nature Reserve, Ellisras District, 18–20.XII.1987, Grobbelaar leg., 1 male, 1 female (SANC); Lydenburg District, 1896, P.A.Krantz leg., 1 female (TMSA); Vryburg, 1918, J.Brown leg., 1 male (SAMC); Vryburg, 1893, E.Simoni leg., 1 male, 1 female (MNHN); Malta, 1928, G.van Son leg., 2 males (TMSA); Shiluvane, 1902, 1 female (SAMC); Shiluvane, H.A. Janod leg., 1 female, 2 spm. (MNHN); Ben Alberts Nature Reserve, Thabazimbi, 24–28.XI.1980, S.J. van Tonder leg., 1 male (SANC); Moorddrift, XII.1914, C.J.Swierstra leg., 1 male (IRSNB); Durban, 1846, Boheman, 1 female (MNHN); Legonyane, 11.I.2011, from mushroom, C. Deschodt leg., 1 male, 4 females (UPSA); ‘Natal’, 1 male (MNHN).

**Distribution**

The species is widely distributed in the northern part of Southern Africa (Figure 3F).

*Delopleurus darrenmanni* Frolov, sp. nov.  
(Figure 4A–F)

**Diagnosis**

This species can be separated from other *Delopleurus* species by the sculpture of its pygidium. Males have punctate, glabrous, narrow disc of pygidium which is almost as long as apical and basal border in the middle (Figure 4B). Females have characteristic slit-shaped disc with a transverse carina in the middle (Figure 4E).

**Description**

*Male*, holotype. Body strongly convex, black, glabrous, its length 6.0 mm (Figure 4A).

Clypeus quadridentate, medial teeth acute (right tooth malformed), lateral ones acute-angled. Clypeal margin laterad of lateral teeth somewhat angulate so clypeus looks hexadentate. Clypeal surface rugose in anterior part and laterally, disc of clypeus and frons densely punctate (punctures separated by less than a puncture diameter).

Pronotum more or less trapezoidal, about two times wider than long. Anterior and lateral margins distinctly bordered, base feebly bordered. Surface relatively sparsely punctate on disc (punctures separated by two to three puncture diameters) and denser laterally.

Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures slightly larger than striae width. Elytral intervals feebly convex, with minute punctation.

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur bifurcated apically.
Pygidium with relatively thick borders and convex disc. Apical border almost as long as disc in the middle. Disc glabrous, punctate with punctures separated by two to four puncture diameters (Figure 4B).

Parameres rounded in lateral view (Figure 4C).

**Female** can be separated from male in having acute, not bifurcated spurs of anterior tibiae and in sculpture of pygidium, which has very wide borders and very narrow disc with transverse keel (Figure 4E).

**Variability.** Body length of the paratypes 4.0–6.2 mm.

**Distribution**
The species is known from three localities in a relatively small area between the Zambezi and Okavango rivers in Zambezian woodland region (Figure 4F).

**Etymology**
The species is named after Darren Mann (OUMNH), who collected the type series.

**Type material**
Holotype, male with the labels ‘Namibia W. Caprivi Park Nova, 5 km north of Okavango River 18°09'56" S, 21°44'31" E, 19.xii.1999. In fungi. Coll. Mann, Marais & Newman’, ‘D.J.Mann colln. OX.UNI.MUS.NAT.HIST (OUMNH) OUMNH-2006-093’. Paratypes, 17 males and 6 females from Namibia, Zambia, and Botswana. Namibia: same data as the holotype, 13 males and 5 females (OUMNH), 2 males and 1 female (ZIN). BOTSWANA: 1 male with the label ‘Savuti Botswana S18.5651 E24.0629 Deschodt Tshikai 07.12.05’ (UPSA). ZAMBIA: 1 male with the label ‘Kabula Loge, Zambia 17.041314 S, 024.013017 E 26–31.xi.2003 Deschodt & Groenewald’ (UPSA).

**Delopleurus gilleti** Janssens
(Figure 5A–F)

**Delopleurus gilleti** Janssens 1939

**Diagnosis**
This species is most similar to male *D. pullus* but can be separated from it in having the pygidium with smaller disc which is punctate with bigger punctures (Figure 5B, E) and in having relatively densely punctate disc of pronotum (Figure 5A, D). This species does not show sexual dimorphism in the sculpture of the pygidium.

**Description**
Beetles are small-sized (3.5–5.0 mm), strongly convex, black or dark brown, glabrous.
**Male (Figure 5A).** Clypeus quadri dentate, medial teeth acute, lateral ones acute-angled. Clypeal margin laterad of lateral teeth somewhat angulate so clypeus looks hexadentate. Clypeal surface rugose in anterior part and laterally, frons densely punctate (punctures separated by less than puncture diameters).

Pronotum about two times wider than long. Anterior and lateral margins distinctly bordered, base not bordered. Pronotum densely almost uniformly punctate with punctures separated by less than a puncture diameter.

Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures slightly larger than striae width. Elytral intervals convex, with minute punctuation.

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur bifurcated apically.

Pygidium with relatively narrow borders and feebly convex disc. Disc glabrous, coarsely punctate with punctures separated by about one puncture diameter (Figure 5B).

Parameres in lateral view somewhat abruptly truncate, with distinct processes (Figure 5C).

**Female (Figure 5D)** can be separated from male in having acute, not bifurcated spurs of anterior tibiae. Sculpture of pygidium is similar to that of male (Figure 5E).

**Type material**

Holotype, female with the labels. ‘Coll. R.I.Sc.N.B Togo Togo Coll. J.J.Gillet’, ‘A. Janssens det., 1939 Delopleurus gilleti n. sp. type’, ‘cf. Expl. P.N.A. G.F. de Witte (1933–1935) fasc 29, 1939, p. 130’, ‘TYPE’, and ‘A. Janssens det., 1941 gilleti A. Janssens’ (IRSNB). Paratypes: male and female with the same locality data as the holotype (IRSNB); female, CONGO (Kinshasa), Kasai, forêt de Luebo, G. Babault (IRSNB).

**Additional material**

CÔTE D’IVOIRE: National Park De La Comoe, Quango, Fitini, IX.1980, Y. Cambefort leg., 1 female (MNHN); Lamto-Savane, Girard leg., I.1968, 1 spm. (MNHN); Lamto, Girard leg., X.1968, 1 male (MNHN); Touba, Biemasso, 1 female (UPSA). MALI: Kita, 1 female (MNHN). NIGERIA: Yankari, 25.VII.1974, G.F. Bornemissza leg., 1 female (SANC); 10 km E of Kontagora, 19.VII.1974, G.F. Bornemissza leg., 14 females (SANC); Samaru, 20.VII.74 G.F.Bornemissza leg., 1 male (MNHN). MALAWI: Mlanje, S.A.Neave: 21.I.1913, 1 female, 6.II.1913, 1 female, 27.XII.1912, 1 male (BMNH); between Ft. Mangoche and Chikala Boma, 20–25.III.1910, S.A.Neave, 1 female (BMNH). NAMIBIA: Kaross, II.1925, 1 spm. (SAMC). TANZANIA: Kigonsera, 1 female (MNHN). ZAMBIA: Mwengwa, 1919, H.C.Dollman leg., 3 females (BMNH). MOZAMBIQUE: Canxixe, 1926, J. Surcouf leg., 1 male (MNHN).

**Distribution**

The species is widely distributed in the savannas both south and north from the equator (Figure 5F).
**Delopleurus krikkeni** Frolov, sp. nov.  
(Figure 6A–D)

**Diagnosis**

This species can be easily separated from other *Delopleurus* species by sparsely punctate to impunctate disc and base of pronotum. Its pygidium is similar to that of *D. fossatus* sp. nov. but differs in having convex basal border distinctly widened medially (Figure 6B). From *D. fossatus* sp. nov. it also differs in having larger eyes (in dorsal view).

**Description**

**Holotype, male.** Body strongly convex, black, glabrous, length 4.6 mm (Figure 6A). Clypeus quadridentate. Two medial teeth acute, lateral ones right-angled. Clypeal surface coarsely punctate in anterior part and laterally, frons densely punctate (punctures separated by one to two puncture diameters).

Pronotum about two times wider than long. Anterior and lateral margins distinctly bordered, base feebly bordered laterally. Disc and base of pronotum impunctate, sides relatively densely punctate.

Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures 1.5–2 times larger than striae width. Elytral intervals convex, with minute punctation.

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur bifurcated apically.

Pygidium with relatively strongly convex disc separate by deep circular fossa from border. The apical border wider medially and somewhat tapering laterally; apical border somewhat tuberculate in the middle (Figure 6B).

Parameres in lateral view with small processes (Figure 6C).

**Paratype, male.** Differs from the holotype in being slightly larger (length 4.8 mm) and having only anteromedial part of pronotal disc impunctate.

**Female** unknown.

**Distribution**

The locality where the holotype was collected is uncertain (Adrian Davis, pers. comm.). In 1896, ‘Samburu’ might refer to a large area to the northwest of Mount Kenya and to the south of Lake Turkana, that was occupied by the Samburu people. But it might also be the railway station (3°46’ S, 39°16” E) on the railroad Mombasa–Nairobi. This latter locality is some 100 km east-northeast of the locality where the paratype was collected, Mkomazi Game Reserve (Figure 6D).

**Etymology**

The species is named after Jan Krikken (Naturalis, Leiden).
Type material
Holotype, male with labels ‘Samburu [KENYA] 30.X to 20.XI.[18]96’, ‘B. E. Africa C. S. Bretton 98-12’, ‘diff. from the others Krikken 1975’ (BMNH). Paratype, male: TANZANIA: Mkomazi GR, Ibaya Camp, unburnt grassland, pitfall traps, 7–8. IV.1995, J.G. Davies leg. (BMNH).

Remarks
Two new species are described in this work from the Eastern Arc Region, D. krikkeni sp. nov. and D. naviauxi sp. nov. The former species is known from two males and the latter from two females only. I believe that these specimens are not conspecific because the male specimens lack a characteristic small tooth apicad of the first major outer tooth on the anterior tibiae, which is found in the D. naviauxi holotype. Sex-dependent modifications of the legs are common in the Scarabaeinae but found in the males only. I think that this additional tibial tooth is sex-independent and should be present in the males of D. naviauxi sp. nov.

Delopleurus fossatus Frolov, sp. nov.
(Figure 7A–F)

Diagnosis
This species is similar to D. krikkeni in having pygidium with deep circular fossa, but can be separated from it by having basal border of pygidium not or indistinctly widened medially, punctate disc of pronotum and smaller, slit-shaped dorsal parts of eyes.

Description
Holotype, male. Body strongly convex, black, glabrous, its length 5.3 mm (Figure 7A).
Clypeus quadridentate. Two medial teeth acute, lateral ones obtuse. Clypeus rugose in anterior part and laterally, frons densely punctate (punctures separated by one to three puncture diameters).
Pronotum about two times wider than long. Anterior and lateral margins distinctly bordered, base feebly bordered. Pronotum densely punctate (punctures separated by one to two puncture diameters on disc, becoming denser laterally).
Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures 1.5–2 times larger than striae width. Elytral intervals convex, with minute punctation.
Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur bifurcated apically.
Pygidium with strongly convex disc separated by deep circular fossa from borders. Apical and basal borders about the same thickness, not significantly thicker in the middle. Disc glabrous and coarsely punctate (Figure 7B).
Parameres with small processes in lateral view (Figure 7C).
Female can be separated from male in having acute, not bifurcated spurs of anterior tibiae. Sculpture of pygidium is similar to that of male but the pygidium is one-eighth to one-ninth shorter (Figure 7E).
Paratypes. Body length varies from 4.5 mm to 5.5 mm, otherwise the paratypes are similar to the holotype.

Type material
Holotype, male with label ‘Nyassaland Mlanje [MALAWI, Mulanje] Feb. 11, 1913 S. A. Neave 1913-140’ (BMNH). Paratypes: 1 male with the same data as the holotype; 13 specimens with the same data as the holotype except for the date of collecting: 27. II.1913, 1 female (BMNH), 24.II.1913, 1 female (BMNH), 14.II.1913, 1 female (ZIN), 7.III.1913, 1 male (BMNH), 19.XII.1912, 2 males (BMNH), 7.I.1913, 1 male (BMNH), 20.II.1913, 1 male (BMNH), 5.III.1913, 1 male (BMNH), 12. I.1913, 1 male (ZIN), 1.II.1913, 1 female (BMNH), 8.II.1913, 1 female (BMNH), 21.I.1913, 1 female (BMNH).

Distribution
The species is known from Mlanje, Malawi (Figure 7F) in the southern Rift Valley.

Etymology
The epithet is a Latin word denoting the sculpture of the pygidium.

_Delopleurus parvus_ (Sharp)
(Figure 8A–F)

_Coptorhina parva_ Sharp 1876.
_Delopleurus cardoni_ Paulian 1934, syn. nov.

Diagnosis
This species differs from the other _Delopleurus_ species in having bilobate glabrous disc of pygidium with very thick borders similar in both sexes (Figure 8B, E), and elytral striae with large punctures (Figure 8A, D).

Description
Beetles are small (4.5–5.2 mm), strongly convex, black or dark brown, glabrous.

Male (Figure 8A). Clypeus quadridentate, medial teeth acute, lateral ones right-angled. Clypeal surface rugose in anterior part and laterally, frons densely punctate (punctures separated by less than puncture diameter).

Pronotum about two times wider than long. Anterior and lateral margins distinctly bordered, base not or feebly bordered laterally. Surface of pronotum densely punctate anterolaterally, sparsely punctate with smaller punctures basally and anteromedially.

Elytra trapezoidal, as wide as long, shiny. Stria fine, with punctures much larger than striae width. Elytral intervals slightly convex to almost flat, with minute punctuation.
Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur bifurcated apically.

Pygidium with wide borders. Disc relatively small, somewhat bilobate, smooth and glabrous (Figure 8E).

Parameres rounded in lateral view, without processes (Figure 8C).

**Female** (Figure 8D) can be separated from male in having acute, not bifurcated spurs of anterior tibiae. Sculpture of pygidium is similar to that of male (Figure 8E).

**Type material**

*Delopleurus parvus* – holotype, female with the labels ‘Ind. Bor.’, ‘Laforte 5821’, ‘ex Mus. D.Sharp 1890’, ‘Museum Paris 1952 Coll. R. Oberthür’, ‘Coptorrhina parva Type D.S.’ (MNHN).

*Delopleurus cardoni* – 3 syntypes with the label ‘Chota-Nagpore Palkot R.P. Cardon VII-VIII 1897’ (MNHN).

**Additional material**

INDIA: Chota Nagpore Nowatoli R.P.Cardon VIII-IX 1896, 3 females, 6 spm. (IRSNB); Chota-Nagpore Nawatoli R.P.Cardon X.1897, 2 spm. (MNHN); Chota-Nagpore Nawatoli R.P.Cardonon 1898, 3 spm. (MNHN); Chota-Nagpore Barway R.P. Cardon VI-VII.1897, 1 spm. (MNHN); Bangalore Chikmagalur Tabourel 1900, 1 spm. (MNHN); Pulney Hills R.P.Castets 1898, 3 spm. (MNHN). SRI LANKA: Coll. R.I.Sc.N.B Ceylan coll. Doherty Collection E.Candeze, 1 female (IRSNB).

**Distribution**

The species is known from a few localities in the Indian Peninsula – southeastern Deccan Plateau and Chota Nagpur Plateau. Locality map (Figure 8F) suggests that it can be associated with transitional zones between moist and dry deciduous forest ecoregions.

**Remarks**

Paulian (1934) described *Delopleurus cardoni* from nine specimens from northern India (‘Chota-Nagpore Nawatoli Palkot, R.P.Cardon VII-VIII.1897’). He separated *D.cardoni* from *D.parvus* on the basis of the punctate disk of pronotum in the former species and smooth in the latter. Comparison of the types of the both nominal species showed, however, that the both have relatively densely punctate disk of pronotum and do not differ significantly in other characters. The new synonymy is therefore established.

*Delopleurus striatus* Arrow

(Figure 9A–D)

*Delopleurus striatus* Arrow 1931

**Diagnosis**

This species (known from a single female) differs from other *Delopleurus* species in having characteristic granulate disc of pygidium (Figure 9C).
Description

**Female.** Body strongly convex, black, glabrous, length 5.1 mm (Figure 9A).

Clypeus appear bidentate with two medial teeth acute (Figure 9B). Clypeus rugose in anterior part and laterally, frons densely punctate (punctures separated by one to three puncture diameters).

Pronotum about two times wider than long. Anterior and lateral margins distinctly bordered, base bordered except in the middle. Pronotum densely punctate anterolaterally, sparsely punctate on the base and anterior part medially.

Elytra trapezoidal, as wide as long, shiny. Stria relatively deep, with punctures 1.5–2 times larger than striae width. Elytral intervals flat, with minute punctuation.

Anterior tibiae with three outer teeth, without a small acute tooth between first outer tooth and apical spur. Anterior tibial spur rounded apically.

Pygidium with relatively thick borders. Disc granulate, without setae (Figure 9C).

**Male unknown**

**Type material**

Holotype, female with the labels ‘India. United Provs. Dehra Dun. 2,000 ft. viii.1927 H.G.Champion’, ‘India H.G.Champion B.M. 1931-8’, ‘Delopleurus striatus type Arrow’, ‘Type’, ‘SYNTYPE’, ‘Delopleurus striatus Arrow M.E.Bacchus det 1975 SYNTYPE’ (BMNH).

**Distribution**

The species is known from the single locality in northern periphery of the Indo-Gangetic Plain (Figure 9D).

**Metacatharsius janssensi** (Frey), comb. nov. (Figure 9E)

**Delopleurus janssensi** Frey, 1963

*Delopleurus janssensi* was described from two specimens from Warder, Somali region of Ethiopia. The holotype, female, has all the diagnostic characters of the genus *Metacatharsius* Paulian (large dorsal eye parts can be seen on the habitual photo, Figure 9E). The paratype is similar to and apparently conspecific with the holotype. In the original description, the author compared this species with *D. pullus* and *D. gilleti* but did not provide characters specific for the genus *Delopleurus*. However, the original description and locality data agree well with the type specimens. There is no doubt that *Delopleurus janssensi* was described from misidentified *Metacatharsius* specimens and the new generic combination is therefore established here.

It is possible that *M. janssensi* is conspecific with another described species of the genus. There are up to 18 species of this genus known from adjacent Somalia (Ferreira 1972) and the genus is currently a subject of taxonomic revision (François Génier, pers. comm.). It is out of the scope of the present work to specify the taxonomic status of *M. janssensi* more exactly.
Type material
Holotype, female with the labels: ‘Wardere Somalia’, ‘Holotype’, ‘TYPE’, ‘Brit. Mus 1963-277’, ‘Delopleurus janssensi det. G. Frey 1963, n. sp. Typus’ (BMNH) and paratype with the labels: ‘Wardere Somalia Oct. 1943, T.H.E. Jackson’, ‘Delopleurus janssensi det. G. Frey 1963, p. Typus’, ‘Cotype’ (NHMB).

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