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Four new *Dichaetomyia* species from Madagascar (Diptera: Muscidae)

Eberhard Zielke

Abstract

Four new species of the genus *Dichaetomyia* Malloch, 1921 are described from Madagascar as *Dichaetomyia aneliyana* spec. nov., *Dichaetomyia circuita* spec. nov., *Dichaetomyia factoti* spec. nov. and *Dichaetomyia pafema* spec. nov. The species belong to a group of *Dichaetomyia* species which are characterized by metallic shiny blue, green or violet body parts. This type of body colouration is known for *Dichaetomyia* only from species originating from Madagascar. The four new species are members of the subgenus *Dichaetomyia* Malloch, 1921.

Keywords: *Dichaetomyia*, new species, metallic shiny, descriptions, diagnosis, Madagascar

Introduction

Among the identified and non-identified Madagascan muscids studied in the years 2015 until recently at the Institute of Biodiversity and Ecosystem Research (IBER), Sofia, Bulgaria were several specimens that belong to the genus *Dichaetomyia* Malloch, 1921. The genus is divided into two subgenera of which the subgenus *Panaga* Curran, 1928 is restricted to Africa, whereas the nominate subgenus *Dichaetomyia* occurs worldwide. Species of both subgenera are known from Madagascar and have been found among the examined material. In particular, specimens of the metallic shiny forms of the subgenus *Dichaetomyia* were quite common. These partly very colourful shiny green, blue or purple species are like most of the other Madagascan species of the genus endemic to the Malagasy subregion.

In two earlier publications ^[1, 2], new species of *Dichaetomyia* were described. Most of which are characterized by a shiny metallic body colour, dark legs and basal sections of the wing veins that are not conspicuously yellow. Specimens showing these criteria partly lead to *Dichaetomyia tristis* (Zielke, 1972) ^[4] in the only available identification key to Madagascan species of the genus. In some cases the flies were assigned by earlier investigators ^[3] also to this species, although they actually belong to other taxa. These misidentified species were now separated recently from *D. tristis* on the basis of other taxonomic criteria ^[1]. The paper in hand also deals with glossy coloured specimens, which, however, clearly differ from the above group by various external taxonomic features. Due to the combinations of their characteristics, hitherto not reported from *Dichaetomyia*, they are considered to be representatives of unknown species that are described below as: *Dichaetomyia aneliyana* spec. nov., *Dichaetomyia circuita* spec. nov., *Dichaetomyia factoti* spec. nov. and *Dichaetomyia pafema* spec. nov.

Materials and Methods

The majority of the Muscidae studied had been collected in the last 25 years by different collectors in different regions of Madagascar. They were loaned by various entomological institutions to IBER for the current investigations. The unidentified muscid specimens were isolated from the in ethanol preserved remains of insect traps, stored in the shelves of the Moravian Museum, Brno, CZ. Most of the insects detected among the remains were in very poor condition, only a small portion of the Muscidae found were suitable for processing and identification. The flies were cleaned and mounted on a pin as recently described ^[2]. Several of the selected specimens were rather fragile and despite very careful handling some of them lost during the preparation process body parts, which were transferred into a gelatine capsule that was then attached to the staging pin.

The vials with the remains contained locality labels, the inscriptions of the locality labels are reproduced verbatim.

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Since information about the collectors were not found or could not be deciphered they are not mentioned in the descriptions apart from one exception.

The identification of the Muscidae is based on the key for the Madagascan Muscidae published by Couri *et al.* [3] in 2006. Since this is the only available key to the Madagascan *Dichaetomyia* species, reference is made to the key several times without mentioning the authors and the year of publication each time. In addition, the newly described species were compared with the descriptions of some other metallic coloured *Dichaetomyia* species [4].

Morphological terminology follows McAlpine [5], but postpedicel [6] is used instead of "first flagellomere" as proposed by McAlpine. Moreover, as already suggested earlier [1] the lateral width of the postpedicel of antenna is called "depth" and usually refers to the greatest depth of the postpedicel. Information about the width of frons always refer, if not stated otherwise, to the shortest distance between the margins of the eyes. Body length was measured in millimetres (mm). The specimens were studied using a Zeiss Stemi SV6 stereomicroscope and images were created by means of a Zeiss Discovery 8 stereomicroscope combined with an AxioCam ERc5s camera as described previously [1, 2]. The undetermined material identified for the paper in hand was compared with numerous identified *Dichaetomyia* specimens. The specimens including paratypes and holotypes were kindly loaned for examination to IBER by the Entomological Departments of: Moravian Museum, Brno, CZ; California Academy of Sciences, San Francisco, CA/USA and in particular by the KwaZulu Natal Museum Pietermaritzburg, SA. Unless otherwise stated in the descriptions, all specimens will be returned to the collections that loaned the material to IBER.

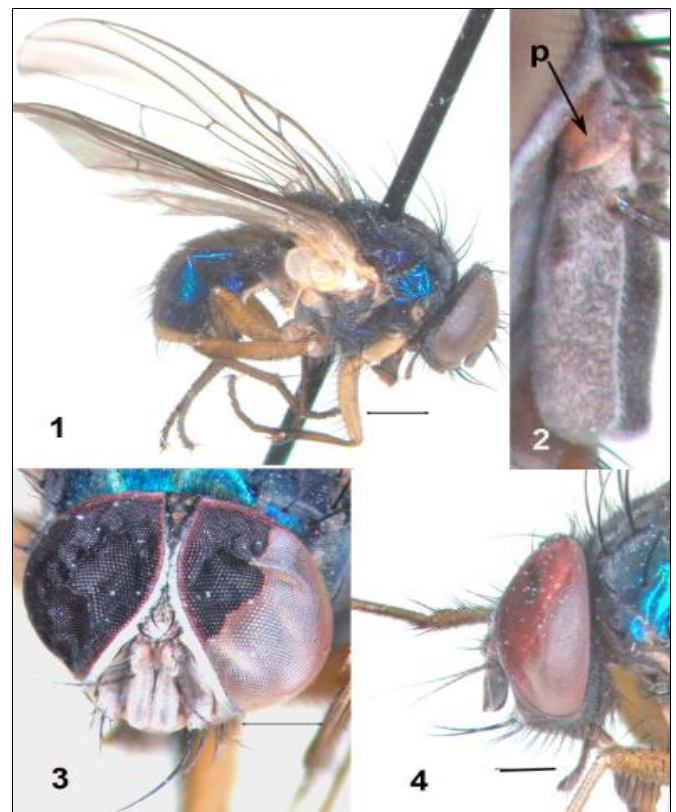
Results

Dichaetomyia aneliyana spec. nov. (Figs 1-7, 18)

Material examined: Male holotype, two male and three female paratypes from "C. Madagascar; 1.604 m, Ambohitantely Spec. Res. S18°11'51,7"E47°17'0,6"; 26.-28.xi.2016"; one male paratype from "C. Madagascar; 1.630 m, Ambohitantely Spec. Res. S18°11'43,3"E47°17'17,7"; 26.-28.xi.2016". When preparing the specimens for identification one mid leg each fell off from one male paratype (labelled as M8) and two female paratypes (M7 and M9) belonging to the batch containing also the holotype. The legs were preserved in individual containers in 80% ethanol for DNA determination. Two male and two female paratypes will be deposited in the entomological collection of IBER.

Description (male): Head. Ground-colour dark, depending on viewing angle more or less greyish-white dusted. Eyes not densely but clearly covered with small hairs, facets next to frons larger than those on the outside of the eye, shortest distance between eyes about equal to diameter of anterior ocellus (Fig. 3). Fronto-orbital plate at shortest distance between eyes about half as broad as diameter of anterior ocellus; fronto-orbital plates touching at middle third of frons and separated by triangular-shaped frontal vitta in the anterior and upper third. Parafacial almost parallel-sided, at level of insertion of arista to postpedicel about as broad as the anterior ocellus. In profile mouth margin in line with profrons (Fig. 4). Genal depth below lowest eye margin about as broad as depth of postpedicel. When viewed from anterior, fronto-orbital plate, face, parafacial and anterior surface of gena whitish-

grey dusted, ocellar tubercle contrasting dark, frontal vitta brownish to dark. Antennal segments predominantly brownish, greyish-white dusted at certain viewing angles, the inner side surface of pedicel mostly shiny yellow-orange (Fig. 2), the outer side only at certain viewing angles. Postpedicel about 3.5 times as long as deep and about three times as long as pedicel. Arista brownish, not conspicuously dilated at basis and slightly longer than twice the length of postpedicel, longest dorsal hairs of arista about 1.5 times as long as depth of postpedicel. Four well developed setae and a few shorter interstitial hairs on the anterior third of fronto-orbital plate and one or two significantly shorter hairs in the middle third, at the level of the anterior tip of the ocellar triangle a strong reclinate orbital seta and a slightly shorter reclinate seta somewhat below. Parafacial bare, facial ridge with a few very small setulae. Vibrissal setae strong and about twice as long as the longest surrounding peristomal setae. Lateral surface of gena brown barely dusted, postgenal and occipital surface dark, with grey dusting and dark seta-like hairs. Proboscis rather short, brown; prementum brown, depending on point of viewing slightly shiny or densely dusted, dilating towards labella; length of labella about 1.5 times as maximal depth of proboscis; palpus brown not dark brown, slender and weakly clavate, somewhat longer than prementum.



Scale bars; Figs: 1, 1 mm, 3-4, 0.5 mm.

Fig 1-4: *Dichaetomyia aneliyana* spec. nov., males; 1) holotype, lateral view; 2) paratype, antenna (p = pedicel, laterally yellowish coloured), length of antenna about 0.8 mm; 3) paratype, head, anterodorsal view; 4) paratype, head, lateral view.

Thorax. Ground-colour shiny dark greenish to bluish-violet (Fig. 1). Mesonotum and postpronotal lobe depending on viewing angle greenish or bluish-violet, when viewed from posterior slightly greyish dusted, presutural part with three broad greyish-white dusted longitudinal stripes, reaching the transverse suture, the paramedian stripes tapering towards the suture, the broad median stripe unchanged in width.

Scutellum uniformly bluish-violet. Pleura depending on light conditions more shiny or greyish dusted, anterior pleura including katepisternum and anepimeron bluish with strong violet reflections in certain light conditions, posterior pleura brown at certain perspective with violet reflections. Anterior spiracle whitish-yellow, conspicuously contrasting to the surrounding area, posterior spiracle brownish with strong black setulae on lower margin. Dorsocentrals 2+2; acrostichals 0 + 1, presutural acrostichal hairs in about six irregular rows, hairs of the rows about equally long; two postpronotal setae, the outer one stronger and almost twice as long as the inner seta; two notopleural setae, anterior one distinctly longer, notopleuron with some small black hairs; pre-alar seta distinct, about half as long as posterior notopleural seta; two intra-alar setae. Greater ampulla without distinct setulae, suprasquamal ridge bare. Prosternum haired, anepimeron with a tuft of setulae above and scattered setulose hairs on the posterior surface. Proepimeral area, katepimeron and meron bare. Katepisternals 1+2, the lower seta distinctly closer to the posterior seta than to the anterior one. Anepisternal setae 1+5, the posterior setae strong, varying in length, the interstitial seta-like hairs clearly shorter. Scutellum with a pair each of strong apical and strong lateral setae, basal and subapical setae not much longer than the longer hairs of ground-hair; lateral surface of scutellum including the margin to the ventral surface with some setulae.

Wing. Membrane hyaline, with a greyish-brownish shimmer, cross-veins and surrounding membrane not infuscate. Tegula yellow, at most with a weak brownish shine, basicosta yellow, stem vein and basal parts of the cubital vein and subcosta strikingly light yellow, contrasting to the subsequent brown parts of the veins. Costal spine short, about twice as long as adjacent bristles. R4+5 dorsally with one to three setulae on the radial node, ventrally radial node and base of vein R4+5 with a few setulae distinctly stronger than the dorsal setulae. Vein M somewhat diverging from vein R4+5, but slightly curved forward to R4+5 before reaching wing margin. Cross-vein r-m at about the level where vein R1 enters costa; distal cross-vein dm-cu sinuous and oblique. Calypters light whitish transparent, at most with a weak yellowish tint; margins broad and dominantly white (Fig. 1), at most with a very weak yellowish tint; the lower calypter about twice as long as the upper one. Haltere uniformly yellow.

Legs. Coxae predominantly, trochanters, femora, tibiae and tarsi completely yellow (Fig. 1). Pulvilli and claws well developed but barely as long as corresponding tarsomere. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae, the posterodorsals and posteriors almost as long as and posteroventrals slightly longer than depth of femur. Fore tibia with a median posterior seta about twice as long as diameter of tibia. Mid femur with an irregular row of short posteroventral seta-like hairs along its length with two or three hairs in basal half almost as long as depth of femur, preapically a short anterodorsal and three strong posterior to posterodorsal setae. Mid tibia with two strong posterior setae longer than the diameter of tibia. Hind coxa bare on posterior surface. Hind femur with complete row of strong anterodorsal setae, at apical third four or five strong anteroventral setae, preapically two strong posterodorsal to dorsal setae. Hind tibia without distinct posterodorsal seta, at middle third with one strong anterodorsal seta distinctly longer than diameter of tibia and usually two weaker anteroventral setae.

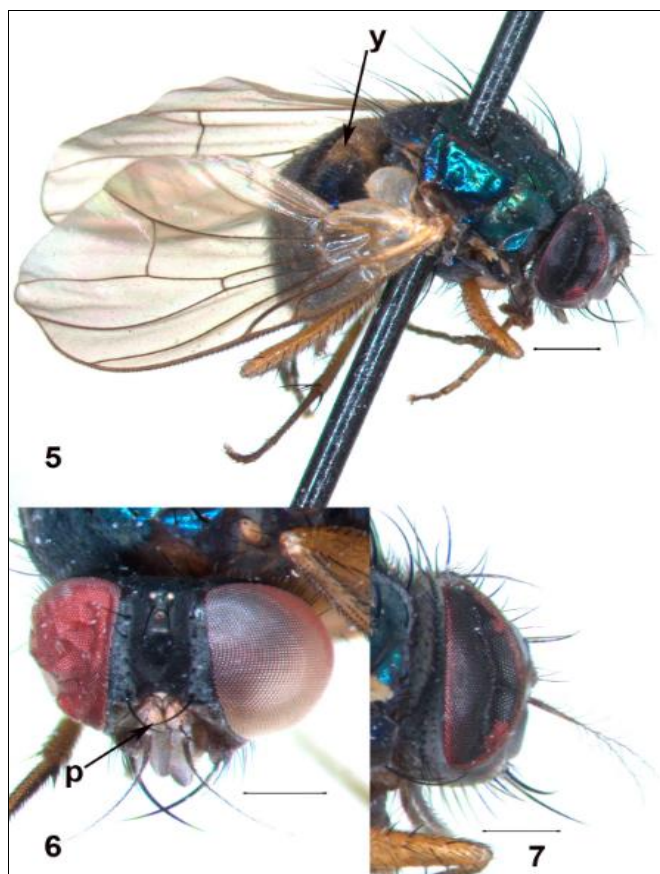
Abdomen depending on conditions of illumination shiny

bluish-green with blue-violet reflections or vice versa. Dorsal surface of syntergite 1+2 yellowish apart from small lateral bluish-green parts, of tergite 3 at least the central third of the dorsal surface partly or completely yellowish to brownish-violet, and tergite five with a narrow yellow apical band, the remaining surfaces of the tergites dorsally, laterally and ventrally shiny greenish-blue or violet, depending on conditions of illumination (Fig. 1). Tergite 3 with a complete row of rather short marginal setae, tergite 4 laterally with about two stronger discal setae and a complete row of long marginals; tergite 5 with a row of longer discal setae and with a complete row of marginals clearly longer than the discal setae. Sternites brownish to yellowish, sternite 5 predominantly yellow and hypopygium conspicuously yellow; sternite 1 haired.

Male genitalia. The species differs significantly from similar species of the genus by several taxonomic features; the identification is not based on features of the genitals. Therefore, the genitals were not extracted in order to avoid damage to the available fragile specimens. In addition, examinations of the male genitals of metallic coloured *Dichaetomyia* species conducted in earlier investigations [3, 4, 7] did not show significant differences between the genitals that would assist in the identification of the individual species. Measurements. Length of body about 7 mm; length of wing about 6.8 mm.

Description (female): Head. Ground-colour dark, almost black, depending on viewing angle partially densely whitish dusted (Fig 6). Dichoptic; eyes with few scattered small hairs, facets of about equal size. Frons dilating towards anterior margin, at level of vertex about 0.28 times as wide as maximal head width, distance between eyes at level of anterior ocellus about four times the distance between the outer margins of posterior ocelli, and at anterior margin of frons directly above lunule 4.7 times as wide. Fronto-orbital plate at midway of frons almost twice as broad as anterior ocellus; frontal triangle very pointed at the level of the third pair of frontal setae. Parafacial distinctly tapering, at level of antenna basis almost as broad as postpedicel and at the lower end about as broad as anterior ocellus. In profile upper mouth margin in line with profrons (Fig. 7). Genal depth below lowest eye margin about as wide as depth of postpedicel. When viewed from anterior fronto-orbital plate predominantly dark brownish to black and greyish-white dusted, parafacial densely whitish dusted, frontal vitta blackish matt, frontal triangle dark, at certain angle of viewing somewhat shiny, ocellar tubercle black. Face and peristomal area brownish, anterior part of gena dark brown, face predominantly densely whitish dusted, peristomal area and gena sparsely dusted. Pedicel of antenna strikingly orange-yellow (Fig. 6), at certain point of viewing slightly whitish dusted, contrasting to the dark brown postpedicel, which is greyish-white dusted in certain light conditions. Postpedicel about three times as long as deep and approximately three times as long as pedicel. Arista brownish, at least twice as long as length of postpedicel, longest hairs of arista a little longer than the depth of postpedicel. In anterior half of fronto-orbital plate four setae and one or two small interstitial hairs, the most anterior seta distinctly and the third seta somewhat longer than the second and fourth setae, in upper half of fronto-orbital plate at level of anterior ocellus a strong reclinate orbital seta with another orbital seta slightly below almost as long and strong as the upper one. An irregular row of

proclinate setulae between eye margin and frontal and orbital setae along the frons. Parafacial bare, fascial ridge in anterior two thirds with several semi erected microscopic setulae, well recognizable. Vibrissal setae strong and more than twice as long as the longest surrounding peristomal setae. Lateral surface of gena dark reddish-brownish to brown, upper half of surface bare, margin of gena and post-occipital more greyish dusted and with dark setae. Proboscis not strikingly long, dilated towards anterior margin, prementum brown and matt, slightly dusted; labella about 1.5 times as long depth of proboscis; palpus brown, somewhat clavate, slightly longer than prementum.



Scale bars; Figs: 5, 1 mm, 6-7, 0.5 mm.

Figs 5-7: *Dichaetomyia aneliyana* spec. nov., female paratypes; 5) dorsolateral view (y = yellowish dorsal surface of syntergite 1+2); 6) head, anterodorsal view (p = strikingly yellow-orange pedicel); 7) head, lateral view.

Thorax very similar to that of the male (Fig. 5). The inner postpronotal seta compared to outer seta even distinctly shorter than in male and the pre-alar seta is clearly shorter than half the length of posterior notopleural seta.

Wing like in male, tegula yellow, basicosta whitish-yellow. Calypters appear even more whitish (Fig. 5).

Legs as in male, the posteroventral hairs of mid-femur, however, somewhat shorter than in male, not all clearly distinguishable from ground-hair; hind tibia at middle third with one strong anterodorsal seta distinctly longer than diameter of tibia and one or two weaker anteroventral setae.

Abdomen predominantly shiny bluish green with distinct violet reflection. Dorsal surface of syntergite 1+2 dorsally either on anterior half or all over the length of the tergite yellowish (Figs 5, 18) apart from the lateral bluish-green parts. Tergites 3 and 4 without yellow markings, tergite 5 with a yellow apical band of different widths, which varies from a

narrow apical band to the width of the apical third of the tergite. Tergite 3 to tergite 5 laterally with a few marginal setae not very long but distinctly longer than the semi erected ground-hair, dorsal marginals barely much longer than the ground-hair and discal setae not recognizable. Sternites yellowish-brown to brown, sternite 1 haired.

Female genitalia not investigated.

Measurements: Length of body about 7.5 mm; length of wing about 6.9 mm.

Diagnosis: The taxonomic features of the species lead in the key to the Madagascan *Dichaetomyia* species [3] directly to *Dichaetomyia femoralis* (Zielke, 1972) [4]. However, *D. femoralis* is characterized by uniformly brown antennae, eyes without distinctly enlarged facets, postpronotal lobe and the area around the anterior spiracle somewhat yellowish, a brownish anterior spiracle, yellowish-brown calypters and a yellow anterior half of syntergite 1+2 of the abdomen. *Dichaetomyia aneliyana* spec. nov. is marked by a yellowish-orange pedicel contrasting to the brown postpedicel, postpronotum and the area around the anterior spiracle are not yellow but concolourous with the mesonotum and the anterior spiracle is strikingly whitish-yellow, the calypters are conspicuously whitish, and in male syntergite 1+2 is dorsally almost totally yellowish as is also tergite 3, the facets of the inner area of the eye are not conspicuously but clearly larger than the facets of the outer area.

Etymology: The epithet "*aneliyana*" is a feminine adjective and it is my pleasure to name this new species after my colleague Aneliya Bobeva, Ph.D. Chief Assistant, Institute of Biodiversity and Ecosystem Research, Animal Diversity and Resources. I wish to express herewith my gratitude for the continuous support she has provided over the years to my studies on Muscidae. By testing and applying various methods for molecular identification of flies she contributed substantially to the identification of muscid specimens of particular taxonomic interest.

Dichaetomyia circuita n. sp. (Figs 8-10)

Material examined: Male holotype; the label reads "VOH/Aug. 2012 Madagascar, Réserv. Expérimentale de Vohimana "Circuit 1"; 870 m, S18°55'33,9"E48°30'22,7", 30.viii.2012, YPT, L.S. Rahanitriniaina & E.M. Rabotoson Igt." Many of the setae and bristles are missing, but the corresponding scars are clearly recognizable.

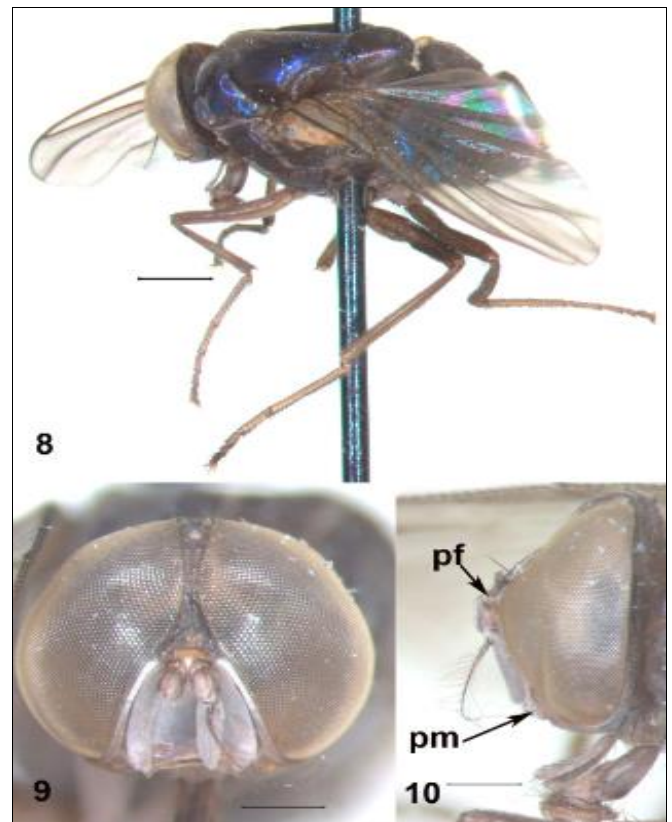
Description (Male): Head. Ground-colour pale brownish, depending on point of viewing more or less greyish-white dusted. Eyes extremely large (figs 9, 10) with some scattered small hairs, anterior facets next to frons slightly enlarged; shortest distance between eyes about equal to diameter of anterior ocellus, width of fronto-orbital plate at shortest distance between eyes barely half the diameter of anterior ocellus; fronto-orbital plates almost touching, separated by a frontal vitta, very thinly line-shaped at middle of frons and triangular-shaped at the upper and lower part. Parafacial almost along the entire length parallel-sided, at level of insertion of arista to postpedicel about half as broad as anterior ocellus. In profile frons somewhat flattened, upper mouth margin in profile distinctly behind profrons (Fig. 10), parafacial practically not visible. Genal depth below lowest eye margin about one third as broad as depth of postpedicel. Fronto-orbital plate and parafacial brown and depending on

viewing angle whitish dusted, frontal vitta and ocellar tubercle dark, face brown densely greyish-white dusted, gena ochre barely dusted. Antennal segments brown, greyish-white dusted, at certain light conditions pedicel weakly ochre (Fig. 10). Postpedicel about 3.8 times as long as deep and three times as long as pedicel. Arista brownish, slightly thickened at base, approximately twice as long as length of postpedicel, longest dorsal hairs of arista about 1.5 times as long as depth of postpedicel. Four strong setae in anterior third of fronto-orbital plate, the anterior seta distinctly longer than the following ones, and one or two very short interstitial hairs, in the middle third two small setulae and in the upper third at level of the anterior tip of the ocellar triangle a strong reclinate orbital seta and further down a somewhat smaller orbital seta. Parafacial bare, facial ridge with a few semi erected microscopic small setulae. Vibrissal setae distinctly stronger and longer than the longest surrounding peristomal setae. Lateral part of gena, postgenal and post-occipital surface yellowish-brown with some dark seta-like hairs. Proboscis brown, distinctly dilated towards labella, prementum brown, somewhat shiny with greyish-brownish dusting; length of labella about 1.5 times as long as anterior depth of proboscis; palpus at certain light conditions at least at basis yellowish-brownish, predominantly slender, only weakly clavate and slightly longer than prementum.

Thorax. Ground-colour dark brown, with distinct violet or bluish shine. Mesonotum depending on viewing angle brown or shiny dark bluish with some violet reflections (Fig. 8), presutural part of mesonotum with three broad whitish-grey dusted stripes reaching the transverse suture and exceeding it when viewed from posterior. Scutellum barely bluish, predominantly shiny violet without a distinct pattern. Anterior lateral pleura depending on point of viewing brown or shiny violet, posterior pleura brown and depending on light conditions shiny or somewhat greyish dusted. Anterior spiracle greyish-brownish, posterior one brown with black setulae at lower margin. Dorsocentrals 2+2; acrostichals 0 + 1, presutural acrostichal hairs in about six irregular rows, hairs of outer rows not distinctly longer than those of inner rows; two postpronotal setae, the outer one distinctly longer and stronger; two notopleural setae, anterior one longer, notopleuron with few small black setulae; pre-alar seta barely half as long as posterior notopleural seta; two intra-alar setae. Greater ampulla without distinct setulae, suprasquamal ridge bare. Prosternum haired, anepimeron with a tuft of setulae above and scattered setulose hairs on the posterior surface. Proepimeral area, katepimeron and meron bare. Katepisternals 1+2, the lower one distinctly closer to the posterior seta than to the anterior one. Anepisternal setae 1+5, the posterior five setae strong, the interstitial hairs much shorter. Scutellum with a pair each of strong apical and strong lateral setae, basal and subapical setae practically not distinguishable from setulose ground-hair; lateral surface and the margin to the ventral surface with some setulae.

Wing. Membrane hyaline, with a yellowish-brownish tinge (Fig. 8), cross-veins and surrounding membrane not infusate. Tegula and basicosta predominantly yellowish with a brownish tint, stem-vein pale yellow, contrasting to the yellowish-brown and brown subsequent parts of the veins. Costal spine very small, barely twice as long as surrounding bristles. Radial node dorsally and ventrally with 1 or 2 setulae, vein R4+5 ventrally at basis with about 3 setulae. Vein M somewhat diverging from vein R4+5, but slightly curved forward to R4+5 before reaching wing margin. Cross-

vein r-m slightly basad from the point where vein R1 enters costa; distal cross-vein dm-cu sinuous and oblique. Calypters transparent whitish-yellowish with yellowish margins, lower calypter 1.5 times as long as upper calypter. Stem of haltere predominantly brown, basal part yellowish, knob brownish-yellowish.



Scale bars; Figs: 8, 1 mm, 9–10, 0.5 mm

Fig 8-10: *Dichaetomyia circuita* spec. nov., male holotype; 8) lateral view, predominantly violet coloured, (due to photographic illumination the colour appears more bluish-violet); 9) head, anterior view; 10) head, lateral view (pm = upper mouth margin distinctly posterior to profrons = pf).

Legs. Coxae, trochanters and femora yellowish-brown to brown, tibiae and tarsi predominantly yellowish. Pulvilli and claws developed but slightly shorter than the corresponding tarsomere. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae. Fore tibia with a scar of a median posterior seta. Mid femur with an irregular row of anteroventral seta-like hairs not as long as depth of femur apart from two hairs in basal half which are about as long as depth of femur, pre-apically with an anterodorsal seta, not as long as depth of femur at level of insertion and three distinctly longer posterior to posterodorsal setae. Mid tibia with two strong posterior setae distinctly longer than the diameter of tibia. Hind coxa bare on posterior surface. Hind femur with complete row of strong anterodorsal setae and about four anteroventral setae at the apical third, preapically two strong posterior to posterodorsal setae. Hind tibia at middle third with one strong anterodorsal seta distinctly longer than diameter of tibia and one weakly developed anteroventral seta.

Abdomen. Without any specific pattern, depending on illumination conditions uniformly shiny brownish-violet, with bluish reflections or violet-bluish with weak greenish reflections, laterally and ventrally predominantly shiny violet, in general barely dusted. Marginals and discals not strongly

developed. Sternites predominantly brown; sternite 1 with some hairs.

Male genitalia. The species is clearly distinguished from similar species of the genus by several taxonomic characteristics. Therefore it has been refrained from extracting the genitalia to avoid inflicting damage on the hitherto only available specimens.

Measurements: Length of body about 5.7 mm; length of wing about 5 mm.

Female not known.

Diagnosis: The new species runs in the identification key to Madagascan *Dichaetomyia* species to *Dichaetomyia basialaris* (Zielke, 1972) ^[4]. However, the two species are fundamentally different at first glance. *Dichaetomyia circuita* spec. nov. is significantly smaller (5-6 mm), the body is uniformly brownish-violet in colour (Fig. 8) and in profile the upper mouth margin is distinctly behind the profrons. In contrast, the body size of *D. basialaris* is about 8 mm, the body colour is metallic blue-green at most with a few violet reflections and in profile the upper mouth margin and profrons are in line.

Etymology: The name “*circuita*” refers to road Circuit 1 where the new species was found. The epithet is a feminine adjective.

***Dichaetomyia factoti* spec. nov. (Figs 11-13)**

Material examined: Female holotype from “C Madagascar, 1604 m, Ambohitantely Spec. Res., S18°11'51.7"E47°17'0.6", 26.-28.01.2016”.

Description (female): Head. Ground-colour dark, depending on viewing angle partially densely greyish-white dusted. Dichoptic; eyes with some scattered small hairs, facets of about equal size. Frons dilating towards anterior margin (Fig. 11), at level of vertex about 0.28 times as wide as maximal head width; at level of anterior ocellus about 3.5 times and at anterior margin of frons 4.4 times as wide as the distance between the outer margins of posterior ocelli. Fronto-orbital plate at middle of frons about twice as broad as anterior ocellus; upper part of frontal triangle rather broad tapering towards midway of frons, lower part not clearly demarcated, at certain viewing angle the anterior tip of the frontal triangle close to the anterior margin of frons (Fig. 12). Parafacial distinctly tapering, at level of antenna basis almost as broad as depth of postpedicel and at the lower end not much broader than anterior ocellus. Facial ridge in lower half at least twice as wide as parafacial. In profile upper mouth margin in line with profrons (Fig. 13). Genal depth below lowest eye margin almost as broad as depth of postpedicel. Depending of viewing angle fronto-orbital plate and parafacial dark or distinctly greyish-white dusted with a shifting dark spot at level of basis of antennae; basis of fronto-orbital plate, frontal vitta and frontal triangle and ocellar tubercle depending on viewing angle dark or uniformly brownish-grey dusted. Face predominantly densely whitish dusted, peristomal area depending on light conditions whitish or greyish dusted. Basal segments of antenna and postpedicel up to the insertion of arista conspicuously yellow (Figs 12, 13) and in striking contrast to the brown part of postpedicel distal of the insertion of arista. Postpedicel about three times as long as broad and about three times as long as pedicel. Arista brownish, approximately twice as long as length of postpedicel, longest

hairs of arista almost twice as long as depth of postpedicel. Two setae in anterior half of fronto-orbital plate, the anterior seta strong and long, the upper one barely one third as long, in addition one or two very short interstitial hairs, in the upper half of frons a strong reclinate orbital seta below the level of anterior ocellus and another reclinate orbital seta much weaker and barely half as long below the strong orbital seta. An irregular row of small proclinate setulae between eye margin and frontal and orbital setae along the length of frons. Parafacial bare, facial ridge with one or two small setulae in lower half, only clearly visible from certain viewing angles. Vibrissal setae strong and almost twice as long as the longest surrounding peristomal setae. Upper half of lateral surface of gena bare, lower surface and post-occipital surface dark, densely greyish dusted and with dark setae, postgenal surface strikingly yellow. Proboscis not conspicuously long, prementum yellow slightly shiny, labella at least 1.5 times as long as depth of proboscis; palpus yellow, slender and weakly clavate, about as long as prementum.

Thorax. Ground-colour dark brownish with striking yellow markings (Fig. 11). Presutural part of mesonotum dark brown to blackish and depending on point of viewing more or less densely dusted, in posterior view with three broad densely greyish dusted stripes, the median stripe reaching the transverse suture unchanged in width and separated from paramedian stripes by very narrow dark brown shiny stripes inside along the presutural dorsocentral setae, the paramedian stripes tapering towards the suture; postsutural part of mesonotum with the surface between the rows of dorsocentral setae and along the scutellar suture shiny dark only sparsely greyish dusted, in certain light conditions with dark reflections with a very weak greenish tint; the lateral surface of postsutural mesonotum covering the area between supra-alar setae to dorsocentrals and transverse suture contrasting shiny reddish brown, partially greyish dusted when viewed from certain angles. Scutellum uniformly yellow, in striking contrast to the adjacent dark brown part of mesonotum. Please insert where it fits best in the section “*Dichaetomyia factoti*” the plate with Figs 11-13, the width of the plate should be equal to width of the column.

Contrast to the adjacent dark brown part of mesonotum. Postpronotum yellow contrasting to the neighbouring dark pleura, apart from the somewhat yellowish area around the anterior spiracle (Fig 11). The lateral pleura brown or dark brown, depending on viewing angle more or less greyish dusted. Anterior and posterior spiracles yellow, posterior one with black setulae at lower margin. Dorsocentrals 2+2; acrostichals 0 + 1, seta less than half as long as posterior dorsocentral seta, presutural acrostichal hairs in six to eight irregular rows, hairs of outer rows not longer than those of inner rows; two postpronotal setae, the outer one more than twice as long; two notopleural setae, anterior one longer, notopleuron with few small black hairs; pre-alar seta distinct, about half as long as posterior notopleural seta; two intra-alar setae. Greater ampulla without distinct setulae, suprasquamal ridge bare. Prosternum brown and sparsely haired, anepimeron with a tuft of setulae above and some scattered setulose hairs on the posterior surface. Proepimeral area, katepimeron and meron bare. Katepisternals 1+2, the lower one distinctly closer to the posterior than to the anterior seta. Anepisternals 1+ 5, the posterior setae strong and of varying length, the interstitial hairs clearly shorter and weaker. Scutellum with a pair each of strong apical and strong lateral setae, the pair of basal and preapical setae at most a fifth as long as the lateral seta but clearly longer than the setulose

ground-hair; lower half of lateral surface predominantly bare, but the margin to the ventral surface with some setulae.

Wing. Membrane with a yellowish-brownish shimmer (Fig. 11), cross-veins and surrounding membrane not infuscate. Tegula and basicosta ochre to brownish, veins brown. Costal spine distinct, at least twice as long as neighbouring bristles. Vein R4+5 dorsally at most with about three setulae on radial node and basis, ventrally with a row of setulae up to midway to cross-vein r-m. Vein M somewhat diverging from vein R4+5, but slightly curved forward to R4+5 before reaching wing margin. Cross-vein r-m about at level of the point where vein R1 enters costa; distal cross-vein dm-cu sinuous and slightly oblique. Both calypters whitish transparent, upper calypter with contrasting narrow dark brown margin, lower calypter with a pale margin, lower calypter about twice as long as upper calypter. Knob and stem of haltere predominantly yellow.

Legs. Coxae, trochanters, femora, tibiae and tarsi yellow. Pulvilli and claws well developed but at most half as long as the corresponding tarsomere. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae, the posterodorsals and posteriors barely as long as depth of femur at level of insertion, posteroventral setae slightly longer than depth of femur at level of insertion. Fore tibia with a median posterior seta almost twice as long as diameter of tibia. Mid femur preapically with a short anterodorsal, one almost dorsal and two posterior to posterodorsal setae. Mid tibia with two strong posterior setae, longer than the diameter of tibia. Hind coxa bare on posterior surface. Hind femur with complete row of strong anterodorsal setae, at the apical third three or four anteroventral setae, the two distal setae stronger, preapically two strong posterodorsal to dorsal setae. Hind tibia without distinct posterodorsal seta, at middle third one strong anterodorsal seta slightly longer than diameter of tibia and two weaker anteroventral setae barely as long as diameter of tibia.

Abdomen. Predominantly shiny only sparsely dusted at certain angles of viewing; latero-dorsal and ventral parts of all tergites dark shiny metallic greenish-blue (Fig. 11) with little violet reflections, the median dorsal surface of the tergites with a diffuse, not clearly shaped yellowish to reddish-brownish longitudinal median marking, very broadly developed on tergites 1+2 and 3, and more stripe-like on tergite four and five. The yellow marking extends to a broad not well demarcated yellowish band at the posterior margin of tergites 3 and 4, and to a yellow coloured apical third of tergite 5. Tergite 3 with a row of short but distinct marginals, tergite 4 laterally with a few discal setae and a row of strong and long marginals, tergite 5 with a row each of discals and marginals, respectively. Sternites yellowish to brownish; sternite 1 laterally with some setulose hairs.

Female genitalia not investigated.

Measurements: Length of body about 7.2 mm; length of wing about 7 mm.

Male not known.

Diagnosis: The female runs in the key to the Madagascan *Dichaetomyia* species to couplet 10 with *D. femoralis* and *Dichaetomyia frontata* Couri, Pont & Penny, 2006 but it does not match the characters of one of the two species which are both marked by predominantly metallic green to bluish-green thorax and abdomen. The thorax of *Dichaetomyia factoti* spec. nov., however, is shiny brownish, partly yellow but not metallic green, and all tergites of the metallic greenish

abdomen are marked by a diffuse, broad but not clearly shaped yellowish to reddish-brownish longitudinal median pattern. In addition, the antennae are dark in both green coloured species, whereas the basal parts of the antenna of *D. factoti* are conspicuously yellow and in contrast to the dark brown distal part of postpedicel (Figs 12, 13).

Etymology: The shiny metallic green abdomen creates the impression that the fly belongs to the group of the metallic coloured Malagasy *Dichaetomyia* species, and the brown and yellow coloured thorax stands for the group of *Dichaetomyia* species with predominantly brown and yellow colours, which are typical for the world occurring species of the genus. Similar to a factotum that also can be active in various functions without actually being a member of the respective professional discipline. Therefore, this species is dedicated to the factotums which are irreplaceable in many institutions. The epithet "factoti" is a noun in the genitive.

***Dichaetomyia pafema* spec. nov. (Figs 14-17)**

Material examined: Female holotype from "C. Madagascar; 1604 m, Ambohitantely Spec. Res. S18°11'51,7"E47°17'0,6" 26.-28.i.2016", a female paratype from " C. Madagascar; 1530m, Ambohitantely Spec. Res. 19.4.2011." The paratype is lacking the right mid leg; the specimen will be deposited in the entomological collection of IBER.

Description (female): Head. Ground-colour dark brown, almost black, in certain light conditions densely whitish dusted (Fig. 15). Dichoptic; eyes with few scattered small hairs, facets of about equal size. Frons at level of vertex about 0.29 times as wide as maximal head width, dilating towards anterior margin, distance between eyes at level of anterior ocellus about 3.5 times the distance between the outer margins of posterior ocelli and at anterior margin of frons directly above lunule 4.5 times as wide as distance between posterior ocelli. Fronto-orbital plate at midway of frons slightly wider than diameter of anterior ocellus; frontal triangle barely reaching level of third pair of frontal setae. Parafacial distinctly tapering, at level of antenna basis almost as broad as depth of postpedicel and at the lower end about as broad as anterior ocellus. In profile upper mouth margin in line with profrons (Fig. 16). Genal depth below lowest eye margin slightly wider than depth of postpedicel. When viewed from anterior fronto-orbital plate predominantly dark brownish to black and greyish-white dusted, parafacial densely whitish dusted, frontal vitta blackish matt, frontal triangle dark, at certain angle of viewing somewhat shiny, ocellar tubercle black slightly dusted at some angles of viewing. Face and peristomal area brownish, anterior part of gena reddish brown, face and peristoma predominantly densely whitish dusted, gena sparsely dusted.

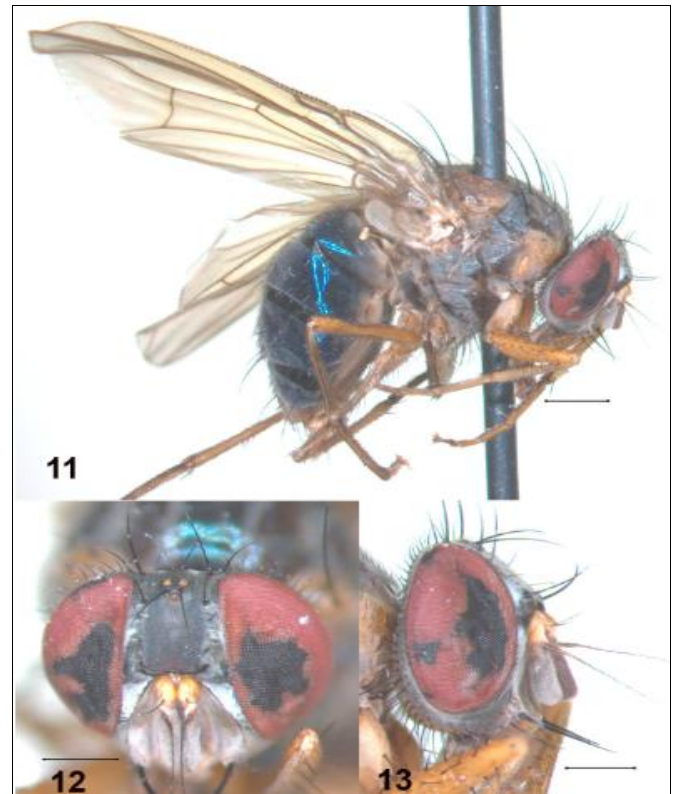
Pedicel and postpedicel uniformly dark brown (Fig. 16), greyish-white dusted in certain light conditions. Postpedicel about 3.7 times as long as deep and about 2.5 times as long as pedicel.

Arista brownish, at least twice as long as length of postpedicel, longest hairs of arista a little longer than depth of postpedicel. Four setae and one or two small interstitial hairs in the anterior half of fronto-orbital plate, the most anterior and the third setae somewhat longer than the second and fourth setae, in upper half at level of anterior ocellus a strong reclinate orbital seta with another orbital seta slightly below. An irregular row of small proclinate setulae between eye

margin and frontal and orbital setae along the length of frons. Parafacial bare, fascial ridge with some semi erected microscopic setulae. Vibrissal setae strong and distinctly longer than the longest surrounding peristomal setae. Lateral surface of gena dark reddish-brownish to brown, upper half bare, margin of gena and post-occipital surface more greyish dusted and with dark setae. Proboscis not strikingly long but strongly dilated towards anterior margin; prementum brown and matt, slightly dusted; labella almost twice as long as depth proboscis; palpus brown with a yellowish tint in certain light conditions, a little clavate, slightly longer than prementum.

Thorax. Ground-colour shiny green to bluish-green with metallic brass or bluish reflections (Fig. 14). Presutural part of mesonotum with three broad whitish dusted stripes, the paramedian stripes strongly tapering towards but barely reaching the transverse suture, the median stripe not reaching the suture. When viewed from posterior, postpronotum distinctly and mesopleuron very scarcely greyish-white dusted. Postpronotum concolorous with mesonotum, scutellum somewhat more bluish. The anterior lateral pleura predominantly concolorous with mesonotum, the posterior pleura uniformly brownish, at certain light conditions with violet or bluish reflections or all pleura slightly greyish dusted. Anterior spiracle white with a clear yellowish tinge, posterior spiracle brown with black setulae at lower margin. Dorsocentrals 2+2; acrostichals 0 + 1, seta not half as long as posterior dorsocentral seta, presutural acrostichal hairs in about eight irregular rows, hairs of outer rows not longer than those of inner rows; two postpronotal setae, the outer seta about twice as long as the inner one; two notopleural setae, posterior seta shorter than anterior seta, notopleuron with few small black hairs; pre-alar seta about half as long as posterior notopleural seta; two intra-alar setae. Greater ampulla without distinct setulae, suprasquamal ridge bare. Prosternum haired, anepimeron with a tuft of setulae above and some scattered setulose hairs on the posterior surface. Proepimeral area, katepimeron and meron bare. Katepisternals 1+2, the lower one distinctly closer to the posterior seta than to the anterior seta. Anepisternal setae 1+6, the posterior strong setae of varying length, distinctly longer than the longest interstitial seta-like hairs. Scutellum with a pair each of strong apical and strong lateral setae, basal and preapical setae much shorter, the pair of basal setae clearly and preapical setae barely distinguishable from the longer ground-hair; lateral surface and margin to the ventral surface of scutellum with some setulae.

Wing. Membrane with a weak brownish shimmer, cross-veins and surrounding membrane not infuscate. Tegula dark yellow and basicosta yellow, stem vein and basis of cubital vein and subcosta pale yellow, contrasting with the subsequent brown parts of veins. Costal spine small, at most 1.5 times as long as neighbouring bristles. Vein R4+5 dorsally with at least one very small setula on the radial node, ventrally with some stronger setulae on radial node and at basal part of R4+5. Vein M somewhat diverging from vein R4+5, but slightly curved forward to R4+5 before reaching wing margin. Cross-vein r-m oblique and slightly basad of the point where vein R1 enters costa; distal cross-vein dm-cu weakly sinuous and slightly oblique. Both calypters whitish to yellowish transparent with yellowish margins, lower calypter almost twice as long as upper calypter. Knob and basal half of stem of haltere yellow, upper half of stem up to the basis of knob brownish.



Scale bars; Figs: 11, 1 mm, 12–13, 0.5 mm

Figs 11-13: *Dichaetomyia factoti* spec. nov., female holotype; 11) lateral view, brownish-greyish thorax and metallic shiny bluish-green abdomen (due to photographic illumination the abdomen appears more bluish); 12) head, anterodorsal view, antenna with striking yellow pedicel; 13) head, lateral view.

Legs. Mid and hind coxae partly yellow partly brown, anterior inner part of hind coxa dark brown at the margin close to the trochanter; trochanters, femora tibiae and tarsi yellow to dark yellow. Pulvilli and claws well developed but clearly shorter than the corresponding tarsomere. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae, the posterodorsals and posteriors barely as long as depth of femur at level of insertion, posteroventrals slightly longer than depth of femur at level of insertion. Fore tibia with a median posterior seta longer than diameter of tibia. Mid femur preapically with a short anterodorsal, and three posterior, posterodorsal and almost dorsal setae. Mid tibia with two strong posterior setae, longer than the diameter of tibia. Hind coxa bare on posterior surface. Hind femur with complete row of strong anterodorsal setae, at the apical third two or three anteroventral setae, preapically two strong posterodorsal to dorsal setae. Hind tibia without distinct posterodorsal seta, in middle third one strong anterodorsal seta slightly longer than diameter of tibia and one or two weaker anteroventral setae barely as long as diameter of tibia.

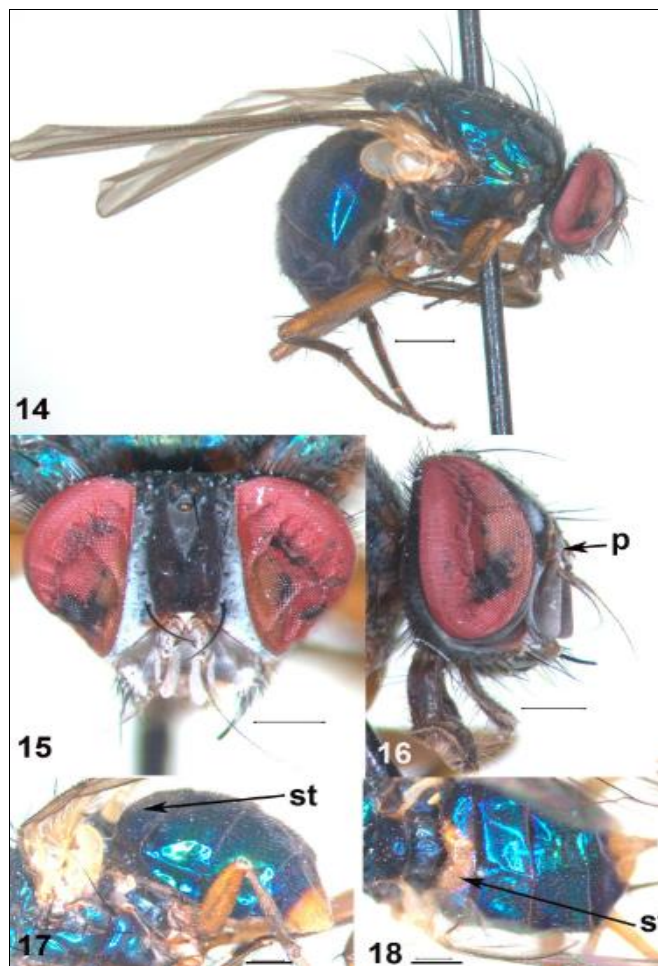
Abdomen. Apart from the yellow apical third or half of tergite five all tergites including anterior and posterior half of syntergite 1+2 shiny green to bluish-violet with strong blue or violet reflections (Figs 14, 17). Tergites dorsally without distinctly enlarged discal and marginal setae. Sternites brownish; sternite 1 laterally haired.

Female genitalia not investigated.

Measurements: Length of body about 8 mm; length of wing about 8 mm.

Male not known.

Diagnosis: The female of *Dichaetomyia pafema* spec. nov. runs in the identification key^[3] to *D. femoralis*, however it is distinguished by the postpronotum and the area around the anterior spiracle being concolourous (Fig. 14) with the mesonotum, whereas these body parts are somewhat yellowish in *D. femoralis*. In addition the anterior spiracle is predominantly white in *D. pafema* and syntergite 1+2 is uniformly concolourous with the subsequent tergites. The anterior spiracle of *D. femoralis*, however, is brownish and at least the anterior half of syntergite is strikingly yellow.



Scale bars; Figs: 14, 17–18, 1 mm, 15–16, 0.5 mm.

Figs 14–18: *Dichaetomyia pafema* spec. nov., female holotype; 14) lateral view; 15) head, anterodorsal view; 16) head, lateral view (antenna uniformly dark brown coloured including brown pedicel = p); 17) abdomen, dorsolateral view (st = syntergite 1+2 concolourous with posterior tergites). 18) *Dichaetomyia aneliyana* spec. nov., female paratype; abdomen, dorsal view (st = syntergite 1+2 with yellow dorsal marking).

The new species is also similar to the above described *Dichaetomyia aneliyana* spec. nov. The species are distinguished by the uniformly brown antenna (Fig. 16) and the shiny greenish or bluish syntergite 1+2 of *D. pafema* (Fig. 17) and the conspicuous yellow-orange pedicel (Fig. 6) of the antenna and the striking dorsal yellow surface of syntergite 1+2 of *D. aneliyana* (Fig. 18). In addition, the anterior inner part of hind coxa is dark brown at the margin close to the trochanter in *D. pafema*, whereas the inner part of hind coxa is completely yellow in specimens of *D. aneliyana*.

Etymology: The epithet of the species name is a feminine adjective and derives from the preliminary assignment "para

femoralis". To keep the name of the species short, the newly created name "*pafema*" is based on the first two and three initials, respectively, of the two words "para *femoralis*".

Remarks

Most specimens of the new species *Dichaetomyia aneliyana* and *Dichaetomyia pafema* were isolated from the vials containing remnants from catches conducted in the Ambohitantely Special Reserve during the 26th and 28th of January 2016. Only one female was collected in the same area in April 2011. In total four males and five females, the latter rather similar to the males, were identified. The four males are characterized by almost identical external taxonomic features and belong obviously to the same species. The characteristics of the females are near to each other as well, however, based on some differences, they could clearly be separated into two groups. The females with yellow marked pedicel and syntergite 1+2 were assigned to the males which showed similar characteristics. In addition, however, the legs which fell off during the preparation process and were preserved as M7, M8 and M9 were used for analysing the DNA sequences. The determination of the DNA sequences confirmed that the male (M8) and the females (M7 and M9) belong to the same species, now described as *D. aneliyana*.

The species *Dichaetomyia circuita* spec. nov. described above resembles on the first glance two other species that were described previously^[1, 2]. The three species are characterized by approximately the same body size and predominantly shiny brown-violet to bluish-violet body colour without distinct yellow markings on thorax or abdomen. *Dichaetomyia diazbastiania* Zielke, 2020 and *Dichaetomyia ambrea* Zielke, 2021 however, are distinguished from *D. circuita* by brown basal parts of the wing veins, while the stem vein and the basal parts of cubital vein and subcosta are strikingly yellow in *D. circuita* and are in contrast to the subsequent dark parts of the wing veins. In addition, the newly introduced species also differs from the two other violet-coloured taxa by the conspicuous head profile with the upper mouth margin distinctly behind the profrons, while - when viewed in profile- profrons and upper mouth margin are in line in the two other species.

As already indicated the brown and yellow coloured thorax of *Dichaetomyia factoti* spec. nov. without any shiny bluish, greenish or violet areas resembles perfectly the colour usually observed in the Afrotropical species of the genus. The metallic shiny dark greenish abdomen, however, is specific for the group of *Dichaetomyia* species which are characterized by colourful metallic shiny body colouration and which are endemic to Madagascar. *Dichaetomyia factoti* seems to be one of the first species in which typical colour features of the two groups can be found side by side, but separated from each other, with one colour complex confined to the thorax and the other to the abdomen.

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I am very grateful to Petr Baňář, curator at the Moravian Museum, for making the preserved remains of insect traps with the unidentified muscids available for this study. The newly identified species were compared with several related species from other institutions. Very helpful for the determination of these four species was in particular the type material received for comparison from the KwaZulu-Natal Museum, Pietermaritzburg, South Africa. I wish to express my sincere thanks for that great support to Kirstin Williams,

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References

1. Zielke E. Correction proposals for some Madagascan *Dichaetomyia* species identified in earlier years, and descriptions of six new species of the genus (Diptera: Muscidae). *Entomologist's Monthly Magazine* 2020;156:209-241.
2. Zielke E. Descriptions of five new shiny *Dichaetomyia* species from Madagascar (Diptera: Muscidae). *Entomologist's Monthly Magazine* 2021;157:81-103.
3. Couri SC, Pont AC, Penny ND. Muscidae (Diptera) from Madagascar: Identification keys, descriptions of new species, and new records. *Proceedings of the Californian Academy of Sciences* 2006;57:799-923.
4. Zielke E. New Muscidae species from Madagascar (Diptera). *Verhandlungen der Naturforschenden Gesellschaft in Basel* 1972;82:145-163.
5. McAlpine JF. Morphology and terminology – adults. In: McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR, Wood DM (eds). *Manual of Nearctic Diptera*. Agriculture Canada Monograph 1981;27:9-63.
6. Stuckenberg BR. Antennal evolution in the Brachycera (Diptera), with a reassessment of terminology relating to the flagellum. *Studia Dipterologica* 1999;6:33-48.
7. Séguy E. Etudes sur les Anthomyiides. 9e, 10e et 11e notes. *Encyclopédie Entomologique (BII)*, Diptera 1935;8:97-116.