

Speciation of *Mascaromyia* Bickel (Diptera: Dolichopodidae) on Réunion Island

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ABSTRACT

New material from Réunion has been examined from several collections. Description of *Mascaromyia martirei* Grichanov, n. sp. is provided. *M. leptogaster* (Thomson, 1869) is recorded on the island for the first time. *Mascaromyia digrediens* Meuffels & Grootaert, 2007 is transferred to the genus *Bickelia* Grichanov, 1996 thus becoming *Bickelia digrediens* (Meuffels & Grootaert, 2007), n. comb. New records and a key to known species of *Mascaromyia* Bickel, 1994 from Réunion are also given. Presently 29 species of *Mascaromyia* are known from western Indian Ocean islands, including 11 species from Réunion. An adaptive radiation of the genus on the islands is briefly discussed.

KEYWORDS: Sciapodinae, *Mascaromyia*, *Bickelia*, long-legged flies, Afrotropical, Réunion, new species, new combination.

INTRODUCTION

The study of the dolichopodid fauna of Réunion is not finished. Up to date it has comprised two species—*Chaetogonopteron nectarophagum* (Curran, 1924) and *Chrysosoma snelli* Curran, 1927—distributed widely in the Afrotropics and Western Orient, and 13 species endemic to the island, i.e., nine species of *Mascaromyia* Bickel, 1994, two species of *Amblypsilopus* Bigot, 1888, and two species of *Nepalomyia* Hollis, 1964 (Grichanov 2017). Several more small-sized dolichopodid species are still awaiting description, being probably endemics to Réunion (from, for example, genera *Chrysotus* Meigen, 1824 and *Peloropeodes* Wheeler, 1890).

The genus *Mascaromyia* is an endemic to the western Indian Ocean islands and originated probably from the closely related *Bickelia* Grichanov, 1996, or from the *constristans* species group of the genus *Sciapus* Zeller, 1842 (Grichanov & Negrobov 2014). Only *M. leptogaster* (Thomson, 1869) is widely distributed, and found on Mauritius, Réunion, Seychelles and Chagos Archipelago. The other *Mascaromyia* species are all endemic to individual islands. The fauna of Mauritius comprises 12 endemic species; Réunion numbers 10, Seychelles 5 species; only one species has been described from Rodrigues (Grichanov 2017, and this paper).

Most *Mascaromyia* species were described and keyed elsewhere (Grichanov 1996a, 2003). Later two new species described from North Island of Seychelles were erroneously associated with this genus (Meuffels & Grootaert 2007, 2009). *M. gerlachi* Meuffels & Grootaert, 2007 was transferred to the Afrotropical genus

Bickeliolus Grichanov, 1996 (Grichanov 2011). The original description and figures provided for *M. digrediens* Meuffels & Grootaert, 2007 are almost identical to characters of *Bickelia parallela* (Macquart, 1842) as described and figured by Grichanov (1996b, 2011). The last two species differ only in setation and shape of hypopygial appendages; therefore, I exclude here the *M. digrediens* from *Mascaromyia*, establishing a new combination *Bickelia digrediens* (Meuffels & Grootaert, 2007), n. comb. *Bickelia parallela* inhabits Mauritius, Seychelles and Chagos Archipelago.

MATERIALS AND METHODS

The paper is based on material I found in the collections of the Museum of Natural History of La Réunion, Reunion Island, France (NHST), the Zoologische Staatssammlung München, Germany (ZSM) and the Zoological Institute, Kiel University, Germany (ZIUK). The holotype of the new species is deposited in the collection of the Muséum national d'Histoire naturelle, Paris (MNHN) and one paratype is housed in the Zoological Institute, St. Petersburg, Russia (ZIN).

Specimens have been studied and photographed with a ZEISS Discovery V-12 stereo microscope and an AxioCam MRc5 camera. Morphological terminology and abbreviations follow Bickel (1994) and Cumming & Wood (2009). The lengths of the antennomeres and podomeres are given in millimetres. Body length is measured from the base of the antenna to the tip of abdominal segment 6. Wing length is measured from the base to the wing apex. The figure showing the hypopygium in lateral view (Fig. 6) is oriented as it appears in the intact specimen, with the morphologically ventral surface of the genitalia facing upwards, dorsal surface downwards, anterior end facing right and posterior end facing left.

TAXONOMY

Genus *Mascaromyia* Bickel, 1994

Diagnosis: Species of the genus share the following characters (they are not repeated in the new species description unless requiring clarification): Body length 3–6 mm, and wing slightly shorter; head is rounded (anterior view); frons metallic blue-green, slightly grey pollinose, with black setae; strong postvertical seta is positioned as a linear continuation of the postocular setae row; upper postocular setae black, lower setae white, long; eyes almost contiguous in middle half of face, small facial triangle under antennae black-brown, whitish pollinose; clypeus and narrow strip above densely covered with fine silvery white pubescence; palpi and proboscis short, yellow brownish, white haired; palpus also with a black seta; acrostichal setae practically absent, only several pairs of microscopic acrostichals on anterior slope of mesonotum; vein R_1 $\frac{1}{3}$ as long as wing; M_1 with rounded right-angular bend; M_2 straight, not reaching posterior margin of wing; crossvein *dm-cu* straight; anal vein and lobe reduced; anal angle absent; alula absent. Male tergite 7 and sternite 7 well developed; hypopygium showing wide range of morphological

diversity, sometimes compact, with short modified cerci; each male cercus forming at least one ventral projection with various ornamentations; basoventral projection always slender and free; surstylus deeply divided into thick dorsal and ventral lobes.

Remarks: The genus *Mascaromyia* is similar to *Bickelia* and *Sciapus* in thoracic chaetotaxy, and overall habitus. The genera can be distinguished by use of the following key:

- 1 Both mid and hind femora with anterior preapical seta; tarsi simple; propleuron with more or less strong ventral setae.....*Bickelia* Grichanov
 – Only hind femur with anterior preapical seta, sometimes poorly developed; some segments of at least fore tarsus often modified; propleuron without strong ventral setae 2
- 2 Each male cercus forming at least one ventral projection with various ornamentations; basoventral projection always slender and free; cerci free; postgonite (proctiger) reduced.....*Mascaromyia* Bickel
 – Male cerci without basoventral projection, free or fused; postgonite (proctiger) developed, often unpaired, projected and fused with ventral side of fused cerci*Sciapus* Zeller

Mascaromyia martirei n. sp.

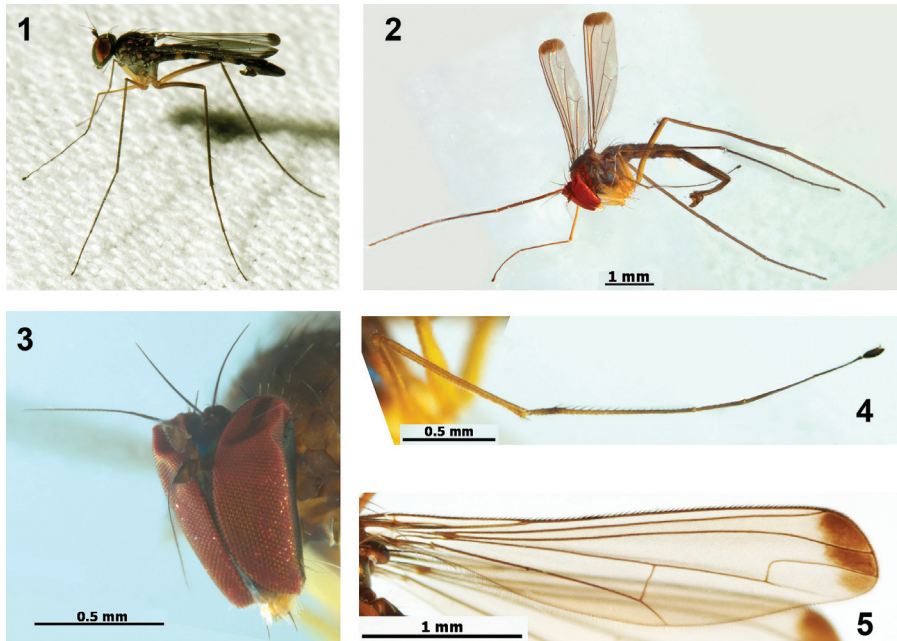
(Figs 1–6)

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Etymology: The species is named for French entomologist Dr Dominique Martiré (La Réunion).

Diagnosis: *M. martirei* belongs to the *leptogaster* group of species, differing in large black spot on distal one-tenth of wing, modification of fore tarsus, cercus being shorter than epandrium and having short acute apex. Other species of the genus have entirely hyaline or evenly darkened wing, or (*M. leptogaster*) posteriorly fumose wing plate. Females are probably indistinguishable from other species.

Description: Male (Figs 1, 2). **Head** (Fig. 3): Hair-like front vertical seta bends forward; antennae a little shorter than height of head, mostly black; scape simple, partly brown; pedicel with ring of short setulae and 1 dorsal seta longer than pedicel; postpedicel black, slightly longer than high at base, triangular, with acute apex, pubescent; stylus basodorsal, short haired; length of scape, pedicel, postpedicel, stylus (segments 1 and 2), 0.06/0.06/0.12/0.09/0.5. **Thorax:** Mesonotum dark bluish green, grey pollinose, pleura brown-black with bronze-blue reflection, and with several small brownish spots, densely grey pollinose; metapimeron black with yellow ventral apex; five strong dorsocentral setae with a stiff hair in front of the 1st one; scutellum with two strong setae and 2 very short lateral marginal hairs. **Legs:** Mostly yellow; coxae yellow; fore tarsus brown from tip of basitarsus, 4th segment on apical half and 5th segment black; mid tibia except



Figs 1–5: *Mascaromyia martirei* n. sp., male: (1, 2) habitus; (3) head; (4) fore leg; (5) wing. (Fig. 1 courtesy Dr J. Rochat)

base and mid tarsus brown; hind femur brown dorsally in distal half, hind tibia and tarsus brown; fore coxa anteriorly with yellow hairs, 1 short black and 1 long golden apical setae, ending with a long thin flattened whitish thorn; mid coxa with two long yellow external setae and small brush of yellow hairs at tip anteriorly; hind coxa with one long black external seta; legs thin, with weak setae; all femora bare; fore basitarsus thin and long, with dorsal row of elongate setulae and regular ventral pectination of curved hairs on distal half; 2nd tarsomere with 3 curved ventral hairs on basal half; 4th segment gradually widened and laterally flattened on distal half; 5th tarsomere widened and laterally flattened, slightly longer than wide (Fig. 4); mid tibia with 1 anterodorsal, 1 posterodorsal setae at basal ¼; tarsus simple; hind tibia with 1 anterodorsal at basal ¼, 4 dorsal and 3 rather small ventral setae; tarsus simple; basitarsus with short basoventral seta; tibia and tarsomere (from first to fifth) length ratios: fore leg: 0.91/0.92/0.27/0.41/0.28/0.12, mid leg: 2.07/1.49/0.48/0.36/0.21/0.12, hind leg: 2.53/1.16/0.59/0.39/0.21/0.14. *Wing* (Fig. 5): Long and narrow, almost hyaline, with black spot on distal one-tenth extending from apex of R_{2+3} to apex of M_2 ; veins brown; ratio of costal section between R_{2+3} and R_{4+5} to that between R_{4+5} and M_{1+2} , 0.4/0.17; ratio of crossvein *dm-cu* to apical part of M_{1+2} (fork-handle) to apical part of CuA_1 , 0.25/0.71/0.24; lower calypter dark yellow, with black edging and yellow cilia; haltere dirty yellow

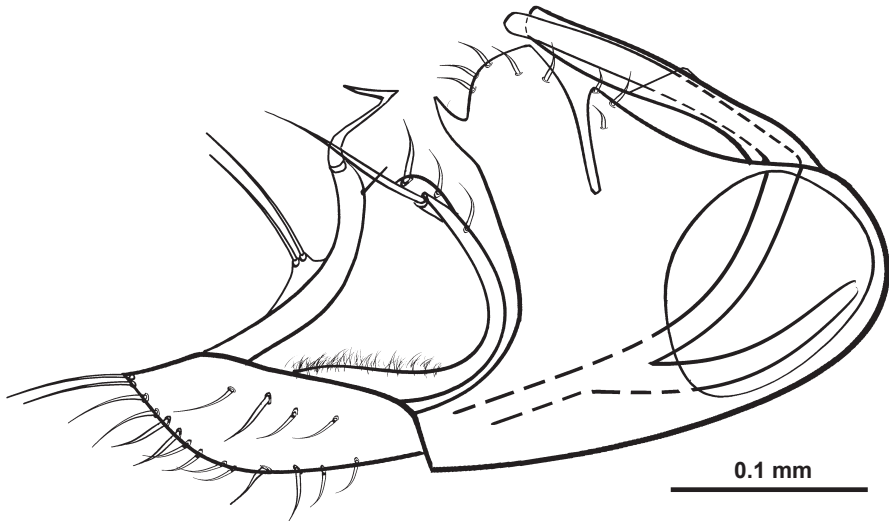


Fig. 6: *Mascaromyia martirei* n. sp., hypopygium, lateral view.

with brown knob. *Abdomen*: Thin, greenish black, weakly shining; tergite 1 black; tergites 2–4 with large yellow midlateral spots; unmodified segments combined about 3 times as long as mesonotum; sternites with short sparse light hairs, brownish yellow; 1st tergite with long light hairs, 1 pair of brown and 2 pairs of black marginal setae; other tergites with short dark hairs and short black setae; 7th abdominal segment and hypopygium (Fig. 6) black; 7th segment with short sparse hairs; 8th segment with several long setae; cercus brown-black, swollen at middle, with acute apex, dorsally and laterally setose, with light hairs and two dirty yellow ventral appendages of equal length; distal appendix bearing 2 long setae at middle, long hooked flattened apical seta and short subapical seta; basal appendix strongly curved, bearing 3 short and 1 long setae at apex. Surstylus black, with short narrow subapical process and several short apical setae. Epandrial lobe subtriangular, bearing 3 short setae.

Measurements (mm): Body length 4.5; antenna length 0.7; wing length 3.4; wing width 0.7; 7th segment of abdomen length 0.75; hypopygium length 0.4.

Female. Similar to male except lacking male secondary sexual characters.

Measurements (mm): Body length 3.8; wing length 3.6; wing width 1.1.

Holotype: ♂ [in ethanol] **France:** La Réunion, St. Philippe, Basse Vallée [21°19'S 55°41'E], alt. 800m, UV light trap, 16.xi.2016, J. Rochat & D. Martiré [MNHN].

Paratypes: **France:** 1♂, Réunion, St. Philippe, Basse Vallée, alt. 700 m, UV light trap, 8.i.2017, J. Rochat [dried and mounted on pin; ZIN]; 3♂ 3♀ [in ethanol; 1♂ in glycerol], F-Réunion, Basse Vallée, Forst. Rav. Baril, 490 m, 21°20'31"S 55°44'28"E, 25.ii.1999, leg. Kassebeer & Hilger [ZIUK and ZIN].

Distribution: France: La Réunion.

NEW RECORDS

Mascaromyia alexisi Grichanov, 2003

Material: France: 2♂, F-Réunion, S' St. Benoit, Le Grand Étang, 500 m, 21°05'47"S 55°38'47"E, at road, 26.ii.1999, leg. Kassebeer & Hilger [ZIUK].

Distribution: France: La Réunion, Route de Takamaka (type locality).

Mascaromyia leptogaster (Thomson, 1869)

Material: France: 2♂ 1♀ [in ethanol], F-Réunion, Hell-Bourg nach Îlet à Vidot, 920 m, river bank, 21°04'07"S 55°30'46"E, 2.iii.1999, leg. Kassebeer & Hilger [ZIUK]; 1♂ 1♀, La Réunion, Le Grand Étang, bank, 27.iv.2002, M. Kotrba [ZSM].

Distribution: La Réunion (new record), Mauritius, Seychelles, Chagos Archipelago.

Remarks. Grichanov (1996, 2003, 2011) provided diagnosis and illustrations for the species.

Mascaromyia loici Grichanov, 2003

Material: France: 1♂, F-Réunion, S' St. Benoit, Le Grand Étang, 500 m, 21°05'47"S 55°38'47"E, at road, 26.ii.1999, leg. Kassebeer & Hilger [ZIUK].

Distribution: France: La Réunion, Plaine des Affouches (type locality).

Mascaromyia tatyanae Grichanov, 2003

Material: France: 11♂, F-Réunion, S' St. Benoit, Le Grand Étang, 500 m, 21°05'47"S 55°38'47"E, at road, 26.ii.1999, leg. Kassebeer & Hilger [ZIUK].

Distribution: France: La Réunion, Forêt de Bébour (type locality).

Key to males of known species of *Mascaromyia* from Réunion

- 1 Thoracic pleura entirely yellow; lateral margins of mesonotum and basal segments of abdomen yellow brownish 2
 - Thorax and abdomen metallic; at most metapleuron and first two abdominal segments partly yellow..... 5
- 2 Mid femur with full row of anteroventral setae in addition to posteroventral row of long hairs..... *bebouensis* Grichanov
 - Mid femur bare..... 3
- 3 Fore tarsus snow-white from tip of basitarsus *grimaldii* Grichanov
 - Fore tarsus dark yellow to black 4
- 4 Cercus nearly 2 times longer than epandrium..... *brooksi* Grichanov
 - Cercus shorter than epandrium..... *cummingsi* Grichanov
- 5 Legs yellow, simple, mid coxae black *duplicata* (Parent)
 - All coxae yellow; if mid and hind coxae brownish, then femora or tibiae partly brown or some tarsomeres modified (enlarged, shortened, thin and long, or white)..... 6

- 6 Fore basitarsus long and thin, more than twice as long as rest tarsomeres
 *cummingi* Grichanov
- Fore basitarsus at most 1.5 times longer than rest tarsomeres 7
- 7 Wing with black spot at apex or with foggy posterior margin in apical half 8
- Wing evenly darkened or hyaline 9
- 8 Posterior margin of wing foggy in apical half *leptogaster* (Thomson)
- Wing with large black spot at apex *martirei* n. sp.
- 9 Cercus at least 3 times longer than epandrium; fore femur bare; 5th segment of
 fore tarsus yellow *michaeli* Grichanov
- Cercus at most as long as epandrium 10
- 10 Cercus with drawn-out apex; smaller species (wing 3.2 mm); 2nd–5th segments
 of fore tarsus brownish *alexisi* Grichanov
- Cercus strongly swollen, with short, nearly right-angular apex; larger species
 11
- 11 Fore femur with 1 or 2 fine ventral setae at base; 5th segment of fore tarsus
 yellow *loici* Grichanov
- Fore femur bare; 5th segment of fore tarsus black *tatyanae* Grichanov

DISCUSSION

The Mascarene Islands (or Mascarenhas Archipelago) comprise Mauritius, Réunion and Rodrigues that lie in the Indian Ocean east of Madagascar (Fig. 7). Mauritius is the oldest of the existing islands (7–10 mya), which were formed along with the submerged Rodrigues ridge. Rodrigues and Réunion originated during the last two million years. The Seychelles (in the northern part of the Mascarene Plateau) are much older. (See McDougall (1971) and Oehler *et al.* (2008) for further reading.)

Comparing the morphology of *Mascaromyia* species from different islands, it is worth noting that the endemic species of Seychelles are characterised in more or less well developed ventral setation on male femora and poorly developed male secondary sexual characters (MSSC) on other podomeres (Lamb 1922; Meuffels & Grootaert 2007, 2009), differing in these apparently plesiomorphic characters from other species of the genus and forming *M. pollicifera* species group that also includes *M. amplicaudata* (Lamb, 1922), *M. grandicaudata* (Lamb, 1922), *M. indistincta* (Lamb, 1922), and *M. magnicaudata* (Lamb, 1922). Only *M. pollicifera* (Lamb, 1922) itself has males with the last tarsomere of the fore leg dilated and twisted, with a small side thumb-like process; the other male podomeres are simple. The widely distributed *M. leptogaster* is characterized by simple male legs; the species originated probably on one of the Seychelles islands and being a possible founder of radiated species complexes on Mauritius and Réunion recently colonized the Chagos Archipelago. I think that the geological history of western Indian Ocean islands supports this hypothesis. During the last 2–10 million years the northern (Seychelles) and southern islands of the Mascarene Plateau were ap-



Fig. 7: Islands of the western Indian Ocean.

parently connected many times by a chain of islands due to sea level changes. The young age of Réunion (2 mya) and a close relation of the Mauritius and Réunion *Mascaromyia* species testify to a rapid speciation in the genus during that period.

Mascaromyia duplicata (Parent, 1932) has been described from Réunion and is characterized by simple male legs (Parent 1932); the species is known only from the original description, no types could be found in the European museums (e.g. Negrobov & Grichanov 1998). This species has unclear position within the genus. Three Mauritius species—*M. desjardinsi* (Macquart, 1842), *M. mauritiensis* (Parent, 1939) and *M. rufiventris* (Macquart, 1842)—are known only from female types and must be probably considered unrecognizable. Most of known *Mascaromyia* species have been described from males only. Their females completely lacked diagnostic specific characters, and their identification and association with males are impossible now as many species have similar size (3.5–4.0 mm), habitus and identical locality data. The other nine Mauritius endemics—*M. albitarsis*

(Parent, 1935), *M. babichae* Grichanov, 1996, *M. bickeli* Grichanov, 1996, *M. dytei* Grichanov, 1996, *M. frolovi* Grichanov, 1996, *M. hutsoni* Grichanov, 1996, *M. kalinkini* Grichanov, 1996, *M. makhotkini* Grichanov, 1996, and *M. shabuni-nae* Grichanov, 1996—are very close to *M. leptogaster*.

So, most of the 24 known species from Mauritius and Réunion are rather similar to each other, forming the *Mascaromyia leptogaster* species group (Grichanov 2003), defined by the frequent presence of remarkable ornamentations (MSSC) on tarsi, sometimes on tibiae and wings (but *M. leptogaster* itself has simple unmodified legs in male). The modified male tarsi, tibiae and wings of the Mauritius and Réunion species are apomorphic characters that also suggest a relatively rapid adaptive radiation of this group on these two nearby islands. The ungrouped species *M. vagabunda* (Lamb, 1926) from Rodrigues (not seen) is characterized in somewhat elongated fore basitarsus and other podomeres simple in males, being probably related to the *M. leptogaster* group.

As a result of this study, 29 species of *Mascaromyia* are known from western Indian Ocean islands, including 11 species from Réunion.

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