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Psychodidae (Diptera) of New Caledonia: checklist and description of a new genus and species

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Abstract. An account of the Psychodidae from New Caledonia is given, including the description of *Cookiellocapsa caledoniensis* gen. & sp. nov. based on male specimens. This new genus of uncertain tribal placement is compared with the genera *Feuerborniella* Vaillant, 1974 (type species *Psychoda obscura* Tonnoir, 1919), *Threticus* Eaton, 1904 (type species *Pericoma lucifuga* Walker, 1856) and *Nielseniella* Vaillant, 1972 (type species *Trichopsychoda maderensis* Satchell, 1955). Important diagnostic and additional morphological characters are illustrated and a checklist of known species of Psychodidae from New Caledonia is provided.

Key words. Diptera, Psychodidae, moth flies, checklist, new genus, new species, taxonomy, New Caledonia, Australasia, Australian Region

Introduction

Moth flies (Psychodidae) are represented only by 9 previously recorded species in New Caledonia (Duckhouse 1991, Léger & Pesson 1993, Curler & Jacobson 2012): *Brunettia aliceae* Duckhouse, 1991, *B. soror* Duckhouse, 1991, *Australophlebotomus maduloae* Léger & Pesson, 1993, *A. notteghemae* Léger & Pesson, 1993, *Sycorax furca* Curler, 2012, *S. sinuosa* Curler, 2012, *S. spina* Curler, 2012, *S. tridentata* Curler, 2012 and *S. webbi* Curler, 2012. In the current paper, we describe a new trichopsychodine moth fly *Cookiellocapsa caledoniensis* gen. & sp. nov. based on males from New Caledonia, collected in two localities: a primary humid forest in the 'Parc Provincial de la Rivière Bleue' (Fig. 23) and a secondary forest along the seashore of Touaourou village at distance of 30 km (Fig. 22). The classification of the subtribe Trichopsychodina has been suggested and discussed by Ježek (1985), Ježek et al. (2011), Cordeiro et al. (2014, 2015) and Kvifte (2015), for the genesis of this problem please refer to the chapter Discussion and comments.

Material and methods

This paper is based on specimens collected by F. Le Pont in New Caledonia during two collecting events (7.–14.iii., 18.ix.–5.x.2015) at Touaourou village (eastern sea shore, South Province, Fig. 22), and the areas of the Provincial Parc of the Blue River (White river and Blue river 22°06′32″S 166°39′36″E, Figs 23–25). The region is characterized by high plant endemicity, with an impressive diversity of different types of vegetation. A primary humid forest is a suitable habitat for *Cookiellocapsa caledoniensis* gen. & sp. nov. The material was collected with CDC miniature light traps placed 1.5 m above the ground in the forest. Specimens examined in this study were preserved in 70% ethanol and subsequently cleared in chloralphenol, treated in xylol and mounted on glass slides in Canada balsam. Observations were made using Carl Zeiss Jena (Germany) and Reichert (Austria) microscopes, with a mirror arm used as a drawing aid. The wing profile photograph was prepared using Zeiss Discovery V12 (Germany) with ZEN software. Line drawings of morphological characters were arranged using a calligraphic pen with black India ink. Type specimens (slides) are deposited in the following institutions (acronyms used below): holotype – Muséum national d' Histoire naturelle, Paris, France (MNHN), one paratype Institut de Recherche pour le Développment, Nouméa, New Caledonia (IRD) and the vast majority of paratypes – National Museum, Praha, Czech Republic (NMPC), where the slides are numbered by Inventory Slide Numbers (Inv. No.) and Catalogue Slide Numbers (Cat. No.).

Morphological terminology for Diptera follows that of Cumming & Wood (2009), the terms ventral epandrial plate or sclerite are used as in Duckhouse (1990a) and wing abbreviations CuA_1 and CuA_2 of Stark et al. (1999).

Taxonomy

Cookiellocapsa gen. nov.

Type species. *Cookiellocapsa caledoniensis* sp. nov., here designated.

Diagnosis. *Cookiellocapsa* gen. nov. is characterized by the following characters: ascoids of basal flagellomeres two-branched, anterior branch with two (or scarcely only one) minute triangular protuberances basally (Fig. 3); basal wing cell not developed (Fig. 10); sensory pocket of wing developed, bulging conspicuously on upper wing surface (Figs 10, 21), anchored on R_5 in the ending of the first third of wing and opened to C; wing membrane bare in distal half (Fig. 10), with numerous scales on sensory pocket and in the near vicinity (anterior and posterior wing margin); medial wing fork quite missing (Fig. 10), basal part of M_2 not developed; course of M_1 and M_2 conspicuously declined basally to sensory pocket (Fig. 10) and arcuated; vein M_1 almost interrupted or weakened in the middle (Fig. 10), hockey stick-shaped and strengthened in basal half of wing; oval strengthened patches of veins R_1, R_2, R_3, M_2 and CuA_1 developed at a distance from vein endings (Fig. 10); position of end of R_1, radial fork and proximal point of basis of neala in one line, forming a 180° angle (Fig. 10); stripe-shaped hypandrium in the middle with two triangular strengthenings (Figs 5, 17); ventral epandrial plate developed, with two boomerang-shaped protuberances proximally, medial block-shaped patch, conspicuously sclerotized and two divergent sessile spine-shaped projections with a globular basis, gradually tapering distally (Fig. 7); hypoproct almost square-shaped (Figs 7, 13, 20), epiproct stripe-shaped, with a semicircular lobulus (Figs 7, 13); aedeagal complex asymmetrical, with three digitiform projections of different lengths (Figs 5, 12, 17, 18); parameres asymmetrical: left paramere (Figs 5, 18) consisting of a staff to one end of which is attached a not freely swinging stick (Fig. 12), right paramere is twofold: spatula-shaped basally (Figs 5, 12, 18) with a rugged blunt end distally (Fig. 18) – distal part of right paramere equipped with a very complicated semicircular swinging part, with many irregular protuberances, loops and spines (Figs 5, 12, 18 in several views, a detail see in Fig. 6).

Differential diagnosis. *Cookiellocapsa* gen. nov. is similar to *Feuerborniell*a Vaillant, 1974, *Threticus* Eaton, 1904 and *Nielseniella* Vaillant, 1972. Morphological differences are accounted in the Table 1 (19 characters are compared): number and modification of ascoid arms of basal flagellomeres; structure of basal wing cell; pilosity of wing membrane; wing index; structure of medial wing fork; course of veins M_1 and M_2; presence of sensory pocket of wing; likeness of vein M_1; presence of oval strengthenings of veins R_1, R_2, R_3, M_2 and CuA_1; angle of end of R1, radial fork and proximal point of basis of neala; shape of hypandrium; presence of epandrial aperture; presence and shape of ventral epandrial plate; shape of hypoproct and epiproct; number of retinaculi; shape of aedeagal complex and parameres. *Nielseniella okinavensis* (Tokunaga, 1959) was not explored here due to its inadequate original description and figures – see comments of Vaillant (1972: 107).

Etymology. The genus is partly named in honour of captain James Cook, British explorer and navigator of 18th century whose achievements in the mapping of Australasia radically changed perceptions of world geography; *capsa* (lat.) = receptacle, sensory box of wing; gender is feminine.

Included species. Only *Cookiellocapsa caledoniensis* sp. nov. from New Caledonia is known.

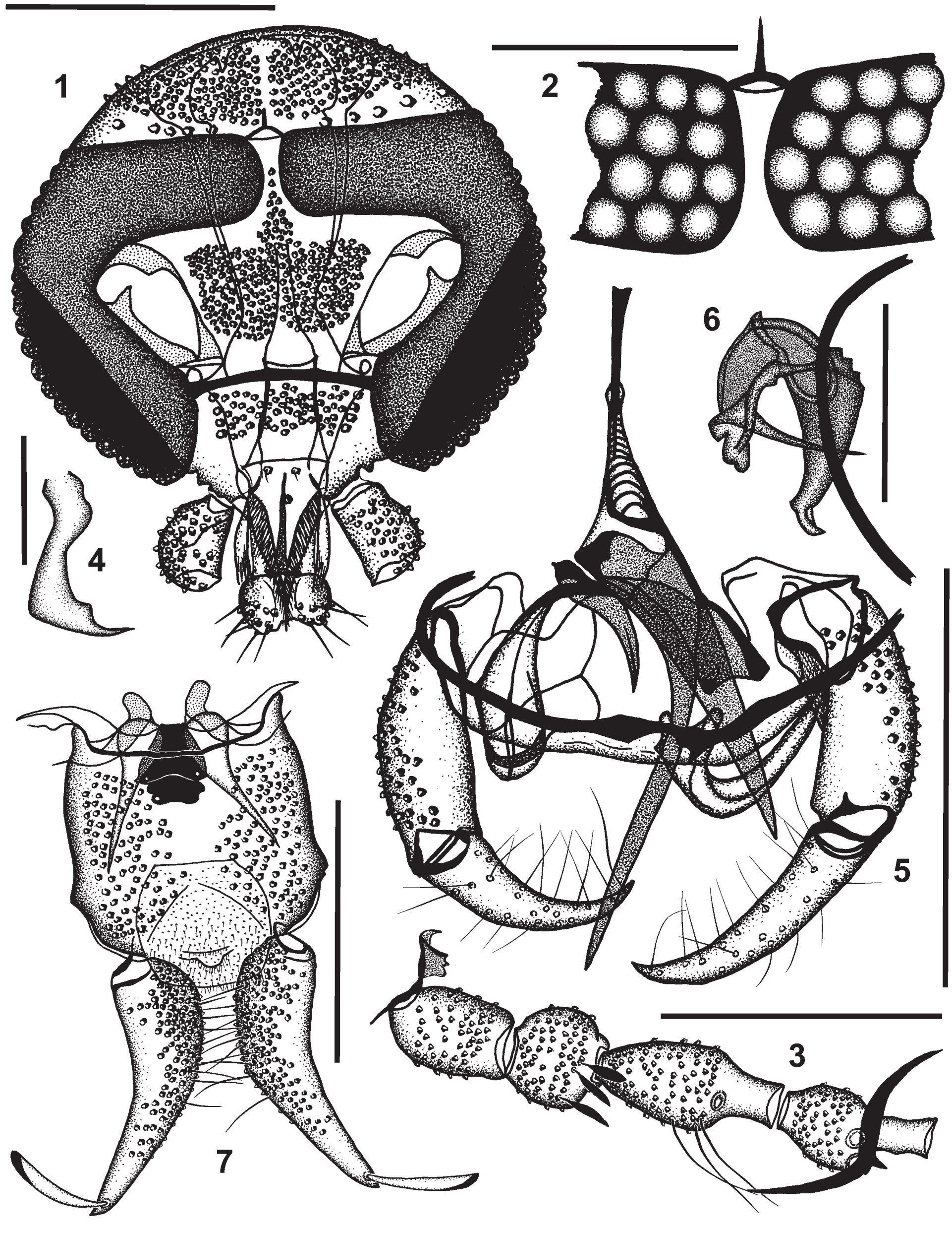
Cookiellocapsa caledoniensis sp. nov.

(Figs 1–21)

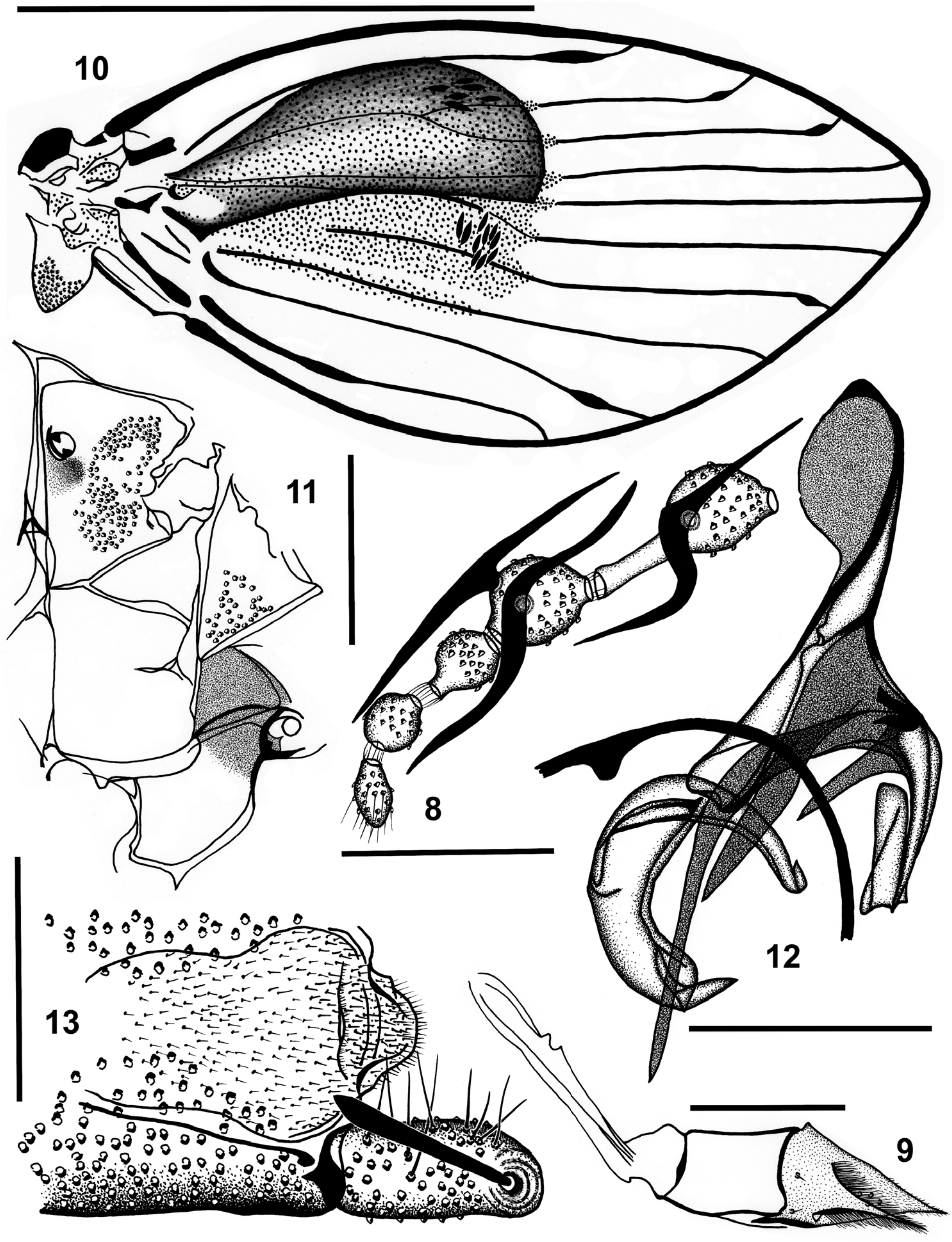
Type locality. New Caledonia, Grande Terre, seashore of Touaourou village (eastern sea shore of New Caledonia).

Type material. Holotype: ♂ (MNHN, dissected, slide, red label), **NEW CALEDONIA:** Touaourou, 7.–14.iii.2015, light trap, LePont leg. Paratypes: 27 ♂♂, from which 11 are of the same locality and data as holotype; 2 paratypes, New Caledonia, Touaourou, 5.x.2015, light trap, LePont leg.; 8 paratypes, New Caledonia, Provincial Parc of the Blue River, White River, vicinity of the station Locomobile, 20.ix.–4.x.2015, light trap, LePont leg.; 1 paratype, same, in addition „Filon de Chrome“; 5 paratypes, New Caledonia, Provincial Parc of the Blue River, White River, „foothills of Pouedihi Mts., Locomobile“, 20.ix.–4.x.2015, light trap, LePont leg. With the exception of one paratype from Touaorou collected in March and placed in IRD (dissected specimen, slide marked by red label), all remaining paratypes are deposited in NMPC (some specimens are dissected, all slides marked by yellow labels sensu Tkoč et al. 2014), Cat. No. 34660–34685, Inv. No. 21971–21996. The figures are primarily based on the holotype.

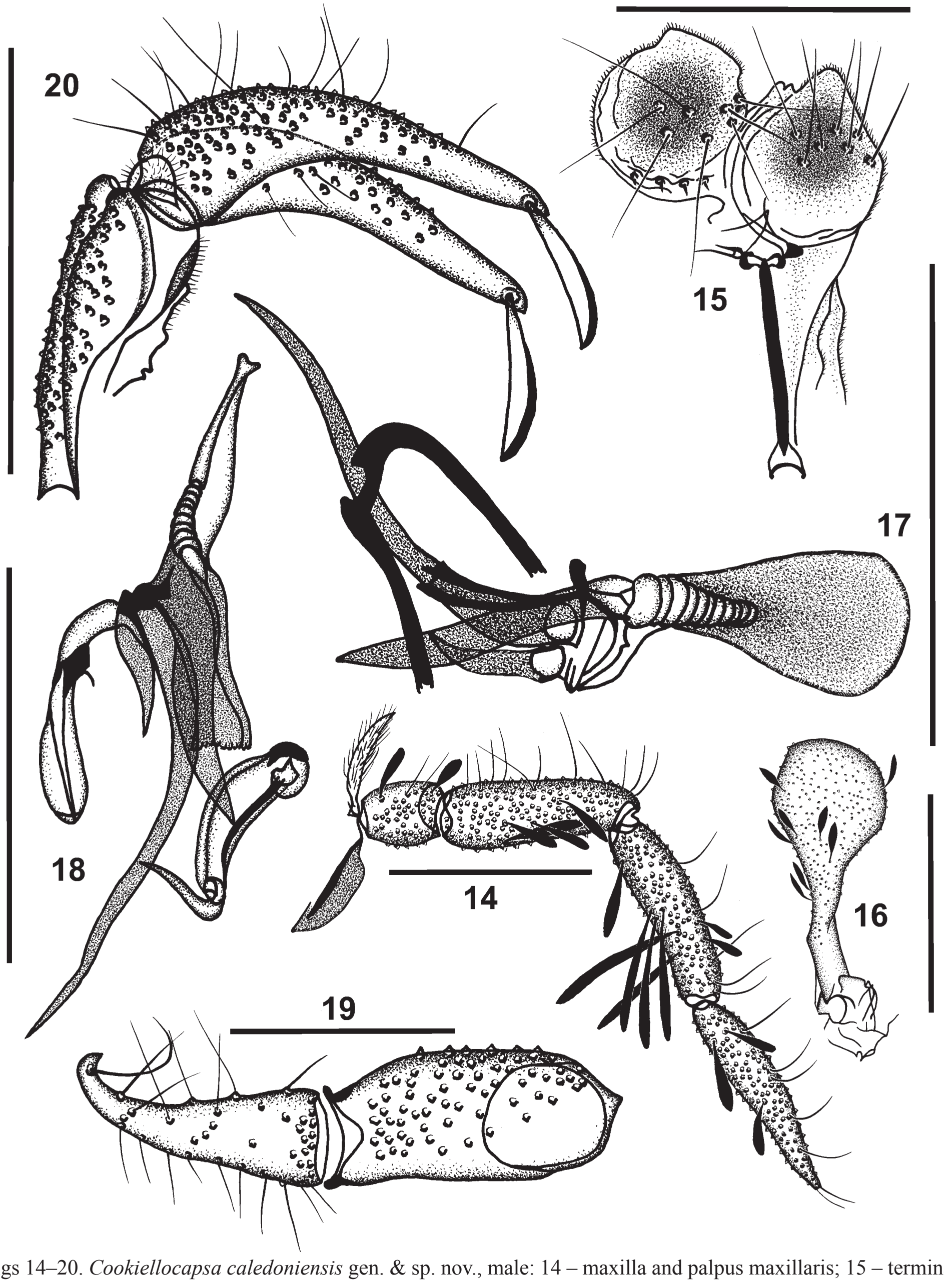
Description. ***Male.*** Head (Fig. 1) almost circular in frontal view, flattened antero-posteriorly, vertex not elevated, without corniculi, insertions of supraocular bristles on dorsal margins of eyes enlarged. Scars on vertex clearly divided by a median, scar free band. Eyes separated, narrowest upper part of frontoclypeus approximately one half of facet diameter (Fig. 2), eye



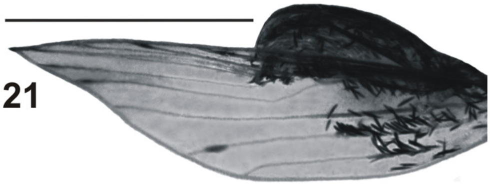
Figs 1–7. *Cookiellocapsa caledoniensis* gen. & sp. nov., male: 1 – head, frontal view (antennae and supraocular lateral bristles omitted, only setae alveoli marked); 2 – detail of facets, frontal view; 3 – scape, pedicel and flagellomeres 1 and 2; 4 – claw of P$_1$; 5 – aedeagal complex and gonopods, dorsal view; 6 – detail of distal part of right paramere and lateral part of hypandrium, diagonal view; 7 – epandrium and surstyli, dorsal view. Scale bars: 1, 3, 5, 7 = 0.2 mm; 2, 6 = 0.1 mm; 4 = 0.03 mm.



Figs 8–13. *Cookiellocapsa caledoniensis* gen. & sp. nov., male: 8 – terminal antennomeres; 9 – cibarium, epipharynx and labrum, dorsal view; 10 – wing; 11 – thoracic sclerites, lateral view; 12 – aedeagal complex and part of hypandrium, lateral view; 13 – left part of epandrium and surstylus, dorsal view. Scale bars: 10 = 1 mm; 11 = 0.2 mm; 8, 9, 12, 13 = 0.1 mm.



Figs 14–20. *Cookiellocapsa caledoniensis* gen. & sp. nov., male: 14 – maxilla and palpus maxillaris; 15 – terminal lobes of labium, dissected; 16 – haltere, lateral view; 17 – aedeagal complex and hypandrium, latero-diagonal view; 18 – aedeagal complex and parameres, dorso-diagonal view; 19 – gonocoxite and gonostyle, lateral view; 20 – epandrium and surstyli, lateral view. Scale bars: 14, 16–18, 20 = 0.2 mm; 15, 19 = 0.1 mm.



Figs 21–25. 21 – *Cookiellocapsa caledoniensis* gen. & sp. nov., male, part of wing in profile. Scale bar: 0.7 mm. 22 – New Caledonia, Touaourou, secondary forest, a giant banian tree (*Ficus benghalensis* L.) growing on an old coral seashore reef (Touaourou cave) – type locality of *Cookiellocapsa caledoniensis* gen. & sp. nov. 23 – New Caledonia, Provincial Park of the Blue River, White River environment, the vicinity of the Station Locomobile and „Pont des Candélabres“, with fully developed trees and a dense population of saplings and understory vegetation. 24–25 – CDC miniature light trap in different views, used in New Caledonia. Photo 21 by R. Gabriš, 22–25 provided by F. Le Pont .

bridge with 4 facet rows. The ratio of the distance between the eye apices (tangential points) to the minimum width of the frons is approximately 15.3 : 1. The interocular frontal suture is well sclerotized (Figs 1, 2), Y-shaped, doubled by a parallel ligament, slightly convex and barely transparent. The scar patch on frontoclypeus (Fig. 1) broad, undivided and rounded anteriorly, with a shallow cleft, not covering tentorial pits, posteriorly with obtuse triangular protuberances on both sides and an acute prolongation extending back to middle level of eye bridges.

Antennae (Figs 3, 8) 16-partite and covered with microtrichiae, trichiae and scales. The scape is almost cylindrical, ratio of length to width 2 : 1 (measured not in narrower basis). The pedicel is spherical, 1.4 times shorter than scape. Flagellomeres are amphora-shaped, slightly asymmetrical, necks are generally shorter than swollen basal parts except for two terminal antennomeres: 15th circular, 16th ovoid. The necks of 13th and 14th antennomeres are very reduced. The sensory filaments (ascoids) are generally two-branched (Fig. 8), ad-

Table 1. Comparison of four genera of Psychodinae with pertinent diagnostic characters (males).

	Feuerborniella **Vaillant, 1974**	***Threticus*** **Eaton, 1904**	***Nielseniella*** **Vaillant, 1972**	***Cookiellocapsa*** **gen. nov.**
Index of the length of scape to pedicel	1.1	0.9–1.9	2.0	1.4
Ascoids of basal flagellomeres	three-armed, arms of similar length	two-armed, arms of similar length	two-armed or anterior part from more rudimental components	two-armed (Fig. 3), anterior part with one or two rudimental protrusions basally
Basal wing cell	developed	developed	developed	not developed (Fig. 10)
Wing membrane	bare	bare	haired	with numerous scales only on sensory pocket (Fig. 10)
Wing index	3.0	2.0–3.0	2.5–2.9	2.1
Medial wing fork	developed	developed, sometimes weakened	developed, very loosely connected	reduced (Fig. 10), base of M_2 not developed
Course of M_1 and M_2	straight, not conspicuously declined	straight, not conspicuously declined	straight, not conspicuously declined	conspicuously declined basally to sensory pocket (Fig. 10)
Sensory pocket of wing	not developed	not developed	not developed	developed (Figs 10, 21)
Vein M_1	linear	linear	linear	not linear (Fig. 10), hockey stick-shaped basally
Oval strengthened patches of veins R_1, R_2, R_3, M_2 and CuA_1	not developed	not developed	not developed	developed in a distance from vein endings (Fig. 10)
Angle of R_1 ending, radial fork and neala basis	140°	130–170°	158°	180° (Fig. 10)
Hypandrium in the middle	stripe-shaped	stripe-shaped or with two small lobulae	stripe-shaped	with two triangular strengthenings (Figs 5, 17)
Aperture of epandrium	developed	developed	not developed	not developed (Figs 7, 13)
Ventral epandrial plate	not developed	not developed	not developed	developed, very complicated (Fig. 7)
Hypoproct	tongue-shaped, rounded	tongue-shaped, rounded	tongue-shaped, rounded	almost square-shaped (Figs 7, 13, 20)
Epiproct	as a fold	as a fold	as a fold	stripe-shaped, with a semicircular lobulus (Figs 7, 13)
Number of retinaculi	1	3	1	1

(continued on the next page)

Table 1. (continued from previous page).

	Feuerborniella **Vaillant, 1974**	***Threticus*** **Eaton, 1904**	***Nielseniella*** **Vaillant, 1972**	***Cookiellocapsa*** **gen. nov.**
Aedegal complex	symmetrical, slender, with one dorsal shaft, strongly curved in lateral view	asymmetrical, complex, with one or more digitiform projections	almost symmetrical, slender, with one dorsal shaft, slightly curved	asymmetrical, with three digitiform projections of variable length (Figs 5, 12, 17, 18)
Parameres	symmetrical	of different shape and length	irregularly shaped,almost same length	asymmetrical: left paramere (Figs 5, 12, 18) simple; right paramere of two components (Figs 5, 6, 12, 18)

ditionally with two minute triangular branches, or scarcely only one (Fig. 3) in the case of basal flagellomeres.

Maxilla and palpus maxillaris (Fig. 14): relative length ratios of palp segments 1.0 : 2.3 : 2.3 : 2.5, the last segment is not annulated. Maxilla is 1.3 times as long as basal palp segment, the mouthparts extend beyond the both ends of basal segments of maxillary palps (Fig. 1). For the terminal lobes of the labium, as shown in Fig. 15, the lines of the spines between lobes are developed (in this slide only left aggregation is visible). Relative ratio of maximum length of cibarium to length of epipharynx approximately 1 : 1 (Figs 1, 9).

Thorax: Thoracic spiracle circular, shape of thoracic sclerites as in Fig. 11 incl. insertions of macrosetae, pteropleurite trapezoidal. Two darkened (infuscated) patches on the thorax: adjacent to spiracle and conspicuously near the insertion of haltere. The length ratios of femora, tibiae and first tarsomeres P_1 2.1 : 2.2 : 1.0, P_2 2.3 : 3.0 :1.1, P_3 2.4 : 3.2 : 1.3, paired tarsal claws of P_1 are S-shaped, irregularly swollen, with prolonged and bent terminal part, pointed (Fig. 4).

Wings (Figs 10, 21) broadly lancet-shaped (length 1.8 mm, paratypes 1.6–2.0 mm), with developed sensory pocket instead of the basal cell, expanding distally, bulging conspicuously on upper wing surface, concave on opposite side, anchored on R_5 in the ending of the first third of this radial vein, and opened to C, covered with numerous scales; vein M_1 almost interrupted or weakened in the middle, hockey stick-shaped and strengthened in basal half of wing; medial wing fork not developed in contrast to radial one, basal part of M_2 reduced; veins R_1, R_2, R_3, M_2 and CuA_1 with oval strengthened patches before the vein endings; a longitudinal strengthened patch developed in CuA_2 in basal half. R_5 ends slightly beyond rounded wing apex. The three wing points: end of R_1, radial fork and basis of neala (proximal foot) are in one line (180°). The bases of M_3, CuA_1 and CuA_2 are not connected. Haltere (Fig. 16): knobs covered with minute, pedunculate and lanceolate scales; ratio of maximium length of halteres to their maximum width 2.6 : 1.0.

Male genitalia with ejaculatory apodeme stick-shaped in dorsal view (Figs 5, 18), annulated distally (Figs 5, 17, 18), blade-shaped in lateral view (Figs 12, 17). Aedeagal complex asymmetrical, with three digitiform projections of different lengths (Figs 5, 12, 17, 18); parameres asymmetrical, forming a complex of dissimilar structures: left paramere (Figs 5, 18) consisting of a loosely attached rod-like sclerite (Fig. 12); right paramere consisting of two components: spatula-shaped basally (Figs 5, 12, 18) with a rugged blunt end distally (Fig. 18), distal part of right paramere with a complex semicircular swinging part, with many irregular protuberances, loops and spines (Figs 5, 6, 12, 18). Gonocoxites almost cylindrical (Figs 5, 19), gonostyli thin, slightly bent, gradually tapering to an acute apex (Fig. 5), hook-like, with a conspicuous subapical bristle (Fig. 19), 1.2 times as long as gonocoxites. Epandrium (Figs 7, 13, 20) with scars separated by scar-free band in medial axis, epandrial notch deep. Central aperture not developed. Ventral epandrial plate (Fig. 7) reduced to two boomerang-shaped protuberances proximally, medial block-shaped patch, conspicuously sclerotized, and two divergent immobile, spine-shaped projections with a globular basis, gradually tapering distally. Hypandrium stripe-shaped, with two triangular strengthenings (Figs 5, 12, 17); hypoproct (Fig. 13, 20) almost square-shaped (Fig. 7); epiproct fold-shaped, with a semicircular lobulus. Surstyli (Figs 7, 13, 20) approximately 1.3 times as long as epandrium, C-shaped, subapically with one not frayed retinaculum, 2.6 times shorter than surstylus.

Female unknown.

Etymology. The new species name is the Latinized adjective *caledoniensis* (*-is, -e*) based on the country of origin.

Bionomics. Unknown.

Distribution. New Caledonia.

A checklist of Psychodidae of New Caledonia

(taxa endemic to New Caledonia are marked by asterisk (*))

Sycoracinae Jung, 1954

***Sycorax* Haliday, 1839 in CURTIS (1839)**

- **S. furca* Curler, 2012
- **S. sinuosa* Curler, 2012
- **S. spina* Curler, 2012
- **S. tridentata* Curler, 2012
- **S. webbi* Curler, 2012

Psychodinae Newman, 1834

***Brunettia* Annandale, 1910**

- **B. aliceae* Duckhouse, 1991
- **B. soror* Duckhouse, 1991

****Cookiellocapsa* gen. nov.**

- **C. caledoniensis* **sp. nov.**

Phlebotominae Rondani, 1840

***Australophlebotomus* Theodor, 1948**

- **A. maduloae* Léger & Pesson, 1993
- **A. notteghemae* Léger & Pesson, 1993

Discussion and comments

There are contraversial definitions of Psychodini as well as taxa related this tribe (see Quate 1959; Vaillant 1971, 1990; Ježek 1984; Duckhouse 1985; Ježek & van Harten 1996; Espíndola et al. 2012; Kvifte 2015). Duckhouse (1985) included genera *Psychoda* Latreile, 1796, *Feuerborniella*, *Neomaruina* Vaillant, 1963, *Epacentron* Quate, 1965, *Philosepedon* Eaton, 1904, *Trichopsychoda* Tonnoir, 1922 and *Threticus* on the basis of ten apomorphic characters in this tribe. The hypothesis of Vaillant (1971, 1990) is based mainly on the shape of labial lobes and male hypopygium, probably plesiomorphic characters sensu Duckhouse (1985). Ježek (1983, 1985) used for Psychodini a suture on the upper side of anepimeron (= pteropleurite) and the absence of an additional anepimeral sclerite, not mentioned by Quate (1959) and Duckhouse (1985); taxa with the anepimeral sclerite were assigned to the subtribe Trichopsychodina of Paramormiini (Vaillant's *Threticus* group of 'Telmatoscopini'). Bravo et al. (2006) used this thoracic character to support the monophyly of *Psychoda* (= Psychodini sensu Ježek 1984), along with the larval antenna provided with two mushroom-shaped elements of Duckhouse (1985) as well as an asymmetrical aedeagus and a digit in the female subgenital plate of Quate (1959). Bravo et al. (2006) suggested an alternative classification of *Psychoda* s. lat.: twelve genera mentioned by Ježek (1984, 2007) and Ježek & van Harten (1996, 2005) were treated as subgenera. In spite of Kvifte (2012), the generic classification of Ježek (1984) was partially incorporated into the Catalog of the Diptera of the Australasian and Oceanian Region (Duckhouse & Lewis 2006). The study of Espíndola et al. (2012) supports the monophyly of the subfamily Psychodinae and the polyphyly of all its tribes, with the sole exception of Psychodini, which is paraphyletic with the subtribe Brunettiina. The subtribe Paramormiina is the most problematic (clades I va, I vol) and the genus *Psychoda* s. lat. consists of several subclades of clade II. However, *Logima* Eaton, 1904 is polyphyletic, separated into two different subclades. Paramormiina (clade IV) and Trichopsychodina (clades I and III) are paraphyletic; the two lines consits of the genera *Threticus* (clade I) and *Trichopsychoda* (clade III) – which may be elvated to distinct subtribes in the future. *Psychoda* s. lat. and Trichopsychodina yet not be resolved as monophyletic on the basis of Curler & Moulton (2012) and Espíndola et al. (2012). The systematic position of the genus *Cookiellocapsa* with uncertain tribal placement should be studied further.

Nineteen important morphological characters (incl. e.g. bizare wing veins, see Tab. 1) are mentioned in the description of the Australasian *Cookiellocapsa caledoniensis* gen. & sp. nov. (probably a new member of Trichopsychodina Ježek, 1985 of Paramormiini with the additional anepimeral sclerite) which differ from *Threticus*, *Nielseniella* and Palaearctic *Feuerborniella* s. str. sensu Vaillant (1971–1983, 1990), Ježek (1985) and Wagner (1990, 1997a,b, 2007). The sensory pocket of the wing is known only from males in three European species of moth flies from the tribe Pericomaini: *Ulomyia fuliginosa* (Meigen, 1804), *U. plumata* (Tonnoir, 1919) and *U. spinifera* Krek, 1990 – see Elger (1981: 2, Figs 1, 2), Duckhouse (1990b: 327, Fig. 21) and Krek (1990: 40, Fig. 5).

The taxonomic position of several species currently placed in *Feuerborniella* s. lat. by Cordeiro et. al. (2014, 2015) should be further studied. Certain morphological characters were not sufficiently explored and discussed in comparison with the type species, *F. obscura*. For example, *F. paramuna* Cordeiro, 2014 is characterized by the end of R_1 being in one line with the radial fork and the ending of CuA_2; *F. pollicaris* (Quate, 1996) and *F. concava* Cordeiro & Bravo, 2015 have the end of R_1 in one line both with the radial fork and the medial one, while the ending of CuA_2 is far from this line; in *F. pilosella* Cordeiro & Bravo, 2015 the above-mentioned line (the end of R_1 and radial fork) is conspicuously proximal to the medial one, in *F. obscura* conspicuously distally to medial fork. In addition, the terminal flagellomeres of Neotropical species of *Feuerborniella* are not completely segmented from each other (G. M. Kvifte, pers. comm.). It should be noted that the above-mentioned redefinition of *Feuerborniella* s. lat. is only preliminary and will be further substantiated in future studies.

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References

BRAVO F., CORDEIRO D. & CHAGAS C. 2006: Two new species and new records of Psychoda Latreille (Diptera: Psychodidae: Psychodinae) from Brazil, with comments on supraspecific classification of the genus. *Zootaxa* **1298**: 1–15.

CORDEIRO D., BRAVO F. & CHAGAS C. 2015: Four new species of Psychodinae (Diptera: Psychodidae) from the Brazilian semiarid region, with contributions to supraspecific classification of Trichopsychodina and a redefinition of Feuerborniella. *Acta Entomologica Musei Nationalis Pragae* **55**: 457–472.

CORDEIRO D., BRAVO F., WOLFF M. & CARVALHO C. J. B. 2014: A new species of Feuerborniella (Diptera: Psychodidae) from the paramo of Colombia. *Acta Entomologica Musei Nationalis Pragae* **54**: 377–382.

CUMMING J. M. & WOOD D. M. 2009: Adult morphology and terminology. Pp. 9–50. In: BROWN B. V., BORKENT A., CUMMING J. M., WOOD D. M., WOODLEY N. E. & ZUMBADO M. A. (eds): *Manual of Central American Diptera Vol. 1.* National Research Council Press, Ottawa, Ontario, Canada, 714 pp.

CURLER G. R. & JACOBSON A. J. 2012: New species of Psychodidae (Diptera) from Australasia, with a checklist of the world species of Bruchomyiinae and Sycoracinae. *Zootaxa* **3552**: 43–65.

CURLER G. R. & MOULTON J. 2012: Phylogeny of psychodid subfamilies (Diptera, Psychodidae) inferred from nuclear DNA sequences with a review of morphological evidence for relationships. *Systematic Entomology* **37**: 603–616.

CURTIS J. 1839: *British Entomology. Vol. 16.* London, plates 722–769, plus 96 unnumbered pages (p. [2] with plate 745).

DUCKHOUSE D. A. 1985: A re-examination of Neomaruina (Diptera, Psychodidae), with observations on its life-history and affinities and redefinition of the tribe Psychodini. *Annals of the Natal Museum* **26**: 601–620.

DUCKHOUSE D. A. 1990a: The Australasian genera of Pericomoid Psychodidae (Diptera) and the status of related Enderlein genera in the Neotropics. *Invertebrate Taxonomy* **3**: 721–746.

DUCKHOUSE D. A. 1990b: Problems in the Palaearctic moth-flies and the identity and affinities of Pericoma undulata Tonnoir and P. plumata Tonn. (Diptera: Psychodidae). *Systematic Entomology* **15**: 321–329.

DUCKHOUSE D. A. 1991: A revision of Australopapuan and New Caledonian Brunettia (Diptera, Psychodidae). *Invertebrate Taxonomy* **4**: 973–1030.

DUCKHOUSE D. A. & LEWIS D. J. 2000: 15. Family Psychodidae. In: EVENHUIS N. L. (ed.): *Catalog of the Diptera of the Australasian and Oceanian Regions*. Available from http://hbs.bishopmuseum.org/aocat/psychod.html (accessed January 2016).

ELGER M. 1981: The ultrastructure of special epidermal organs in Psychodidae (Diptera). 1. Appendages on the mesothorax of male Ulomyia fuliginosa (Meigen). *Acta Zoologica* (Copenhagen) **62(1)**: 1–16.

ESPÍNDOLA A., BUERKI S., JACQUIER A., JEŽEK J. & ALVAREZ N. 2012: Phylogenetic relationships in the subfamily Psychodinae (Diptera, Psychodidae). *Zoologica Scripta* **41**: 489–498.

JEŽEK J. 1983: Intergeneric relationships of selected tribes of the subfamily Psychodinae (Diptera, Psychodidae). *Acta Entomologica Musei Nationalis Prgae* **41**: 254–259.

JEŽEK J. 1984: Six new genera of the tribe Psychodini End. (Diptera, Psychodidae). *Acta Faunistica Entomologica Musei Nationalis Pragae* **17**: 133–153.

JEŽEK J. 1985: Contribution to the knowledge of a new subtribe Trichopsychodina (Diptera, Psychodidae) from Czechoslovakia. *Sborník Národního Muzea, Řada B* **40** (1984): 65–92.

JEŽEK J. 2007: New records of moth flies (Diptera, Psychodidae) from Poland with description of Apsycha gen. nov. *Acta Zoologica Universitatis Comenianae* **47(2)**: 145–160.

JEŽEK J., LE PONT F., MARTINEZ E. & MOLLINEDO S. 2011: Three new species of non-biting moth flies (Diptera: Psychodidae: Psychodinae) from Bolivia, with notes on higher taxa of the subfamily. *Acta Entomologica Musei Nationalis Pragae* **51**: 183–210.

JEŽEK J. & VAN HARTEN A. 1996: Psychodidae (Diptera) of the Cape Verde Islands, captured with a Johnson-Taylor suction trap. *Boletim do Museu Municipal do Funchal, História Natural* **48**: 63–86.

JEŽEK J. & VAN HARTEN A. 2005: Further new taxa and little-known species of non-biting moth flies (Diptera, Psychodidae) from Yemen. *Acta Entomologica Musei Nationalis Pragae* **45**: 199–220.

KREK S. 1990: Ulomyia spinifera n. sp. (Psychodidae, Psychodinae). *Godišnjak Biološkog Instituta Univerziteta u Sarajevu* **43**: 37–41 (in Serbian, German summary).

KVIFTE G. M. 2012: Catalogue and bibliography of Afrotropical Psychodidae: Bruchomyiinae, Psychodinae, Sycoracinae and Trichomyiinae. *Zootaxa* **3231**: 29–52.

KVIFTE G. M. 2015: The Afrotropical genera of Psychodini: Redefinition of the tribe, first Afrotropical record of Perithreticus Vaillant, 1973 and description of Soeliella gen. nov. (Diptera: Psychodidae: Psychodinae). *Zootaxa* **3986(1)**: 115–126.

LÉGER N. & PESSON B. 1993: Première mention de Phlébotomes en Nouvelle Caledonie et description de deux espèces nouvelles (Diptera Psychodidae Phlebotominae). In: MATILE L., NAJT J. & TILLER S. (eds): Zoologica Neocaledonica. Vol. 34. *Memoires du Museum National d'Histoire Naturelle* **157**: 123–129.

QUATE L. W. 1959: Classification of the Psychodini (Psychodidae: Diptera). *Annals of the Entomological Society of America* **52**: 444–451.

STARK J., BONACUM J., REMSEN J. & DESALLE R. 1999: The evolution and development of Dipteran wing veins: a systematic approach. *Annual Review of Entomology* **44**: 97–129. (available from http://dx.doi.org/10.1146/annurev.ento.44.1.97)

TKOČ M., PECHAROVÁ M. & JEŽEK J. 2014: Catalogue of the type specimens of Diptera deposited in the Department of Entomology, National Museum, Prague, Czech Republic. Moth flies (Psychodidae). *Acta Entomologica Musei Nationalis Pragae* **54**: 789–837.

VAILLANT F. 1971–1983: 9d. Psychodidae–Psychodinae (not finished). In: LINDNER E. (ed.): *Die Fliegen der palaearktischen Region*. Stuttgart. Vols. **287** (1971), pp. 1–48; **291** (1972), pp. 49–78; **292** (1972), pp. 79–108; **305** (1974), pp. 109–142; **310** (1975), pp. 143–182; **313** (1977), pp. 183–206; **317** (1978), pp. 207–238; **320** (1979), pp. 239–270; **326** (1981), pp. 271–310; **328** (1983), pp. 311–357.

VAILLANT F. 1990: Propositions pour une révision de la classification des Diptères Psychodidae Psychodinae. *Bulletin de la Société Vaudoise des Sciences Naturelles* **80(2)**: 141–163.

WAGNER R. 1990: Family Psychodidae. Pp. 11–65. In: SOÓS A. (ed.): *Catalogue of Palaearctic Diptera. Vol. 2. Psychodidae – Chironomidae*. Akadémiai Kiadó, Budapest, 499 pp.

WAGNER R. 1997a: Diptera Psychodidae, Moth Flies, Pp. 133–144. In: NILSON A. (ed.): *The aquatic Insects of North Europe 2*. Apollo Books, Stenstrup, Denmark, 440 pp.

WAGNER R. 1997b: Family Psychodidae. Pp. 205–226. In: PAPP L. & DARVAS B. (eds): *Contributions to a manual of Palaearctic Diptera (with special reference to flies of economic importance). Vol. 2.* Science Herald, Budapest, 592 pp.

WAGNER R. 2007: Fauna Europaea: Psychodidae. In: JONG H. de (ed.): *Fauna Europaea: Diptera, Nematocera. Fauna Europaea version 1.3.* http://www.faunaeur.org (last update: 27 January 2011, version 2.4).