

# Revisory notes on *Feuerborniella* Vaillant, 1971, with the first record of the genus from the Afrotropical region (Diptera, Psychodidae)

Gunnar Mikalsen Kvifte<sup>1</sup>, Santiago Jaume-Schinkel<sup>2</sup>

<sup>1</sup> Department of Biosciences and Aquaculture, Nord University, P.O. Box 2501, 7729 Steinkjer, Norway

<sup>2</sup> Zoologisches Forschungsmuseum Alexander Koenig, Leibniz-Institut für Biodiversität der Tiere, Adenauerallee 127, D-53113 Bonn, Germany

<https://zoobank.org/5C970D95-0F4E-43D0-A6AB-CEB51E84124E>

Corresponding author: Gunnar Mikalsen Kvifte ([gunnar.mikalsen-kvifte@nord.no](mailto:gunnar.mikalsen-kvifte@nord.no))

Academic editor: D. Zimmermann ♦ Received 11 November 2022 ♦ Accepted 9 February 2023 ♦ Published 16 March 2023

## Abstract

We establish a diagnosis for *Feuerborniella* Vaillant, 1971, based on a re-description of its type species, *Feuerborniella obscura* (Tonnoir, 1919) and comment on earlier diagnoses. *Feuerborniella sinefurcata* Kvifte & Jaume-Schinkel, **sp. nov.** is described, based on material from Tanzania, representing the second Afrotropical species of the genus following *Psychoda morogorica* Wagner & Andersen, 2007 which we treat as *Feuerborniella morogorica* **comb. nov.** We furthermore review earlier combinations, transferring *Philosepedon ensiger* Quate, 1996 and *Philosepedon longistylus* Quate, 1996 to *Feuerborniella* **comb. nov.**, and briefly discuss generic limits with *Quatiella* Botosaneanu & Vaillant, 1970 and *Nielsenella* Vaillant, 1971.

## Key Words

moth flies, moth fly, Psychodinae, Psychodini

## Introduction

The genus *Feuerborniella* was named by Vaillant (1971), with the European species *F. obscura* (Tonnoir, 1919) as the type species. The original circumscription of the genus also comprised two species from Brazil and one from the Malay Archipelago, but the definition remained unclear for many years due to confusion with the closely-related *Quatiella* Botosaneanu & Vaillant, 1970 and different opinions amongst specialists regarding generic limits in Psychodini/Trichopsychodina (see discussions in, for example, Kvifte (2015); Ježek and Le Pont (2016); Kvifte et al. (2018); Kvifte (2019)).

*Feuerborniella* was redefined by Ibáñez-Bernal (2004), Cordeiro et al. (2014) and Cordeiro et al. (2015); the latter definition was not recognised by Ježek & Le Pont (2016) or in the classifications used in Brown et al. (2018) and Borkent et al. (2018). This is due to many characters within the diagnosis being polymorphic within

the genus concept and one (the fusion of flagellomeres 11 and 12) is even polymorphic within species of Psychodini (see, for example, Quate (1955), p. 231). Furthermore, *Feuerborniella obscura*, the type species of the genus, differs from their diagnosis in at least two characters: flagellomere 11 and 12 are separated (e.g. Vaillant (1974), fig. 267) and the female cerci are equal or slightly shorter in length than the width of the female genital plate (Gunnar Mikalsen Kvifte, pers.obs.).

In the present paper, we thus follow the diagnoses given by Ježek (1985) and Ibáñez-Bernal (2004); however, in order to expand upon these, we also provide a supplementary re-description of the type species of the genus, *Feuerborniella obscura* from Europe. We also describe *Feuerborniella sinefurcata* sp. nov. from Tanzania and transfer *Psychoda morogorica* Wagner & Andersen, 2007, *Philosepedon ensiger* Quate, 1996 and *Philosepedon longistylus* Quate, 1996 to *Feuerborniella*, **comb. nov.**

## Materials and methods

The studied specimens are deposited at the Royal Belgian Institute of Natural Sciences (**RBINS**), the Department of Natural History, University Museum of Bergen, Bergen, Norway (**ZMBN**) and the personal collection of Rüdiger Wagner (**RW**). In the material examined section, the holding institution is indicated at the end of each record and between square brackets ([ ]).

Measurements were made with an ocular micrometer in a microscope Leitz model Dialux 20, measurements are given in millimetres (**mm**). Head width was taken at the widest part, approximately above the insertion of the antennal scape, whereas the length was taken from the vertex to the lower margin of the clypeus; wing length was measured from the base of the wing at the start of the costal node to the apex of the wing-tip, while the width was taken approximately at an imaginary vertical line crossing the radial and medial forks; palpal proportions are given considering the length of the first palpal segment as a unit (1.0).

Morphological terminology is according to Kvifte and Wagner (2017).

## Taxonomy

### *Feuerborniella* Vaillant, 1971

*Feuerborniella* Vaillant, 1971: 119. Type species: *Psychoda obscura* Tonnoir, 1919.

**Diagnosis (modified from Vaillant (1974) and Ibáñez-Bernal (2004)).** Eyes separated; flagellomeres 11–14 reduced in size, fused or separated; labellum of both sexes fleshy, carrying spines and hairs, but not blunt teeth; wing membrane without pilosity; R5 ending in wing apex; male genitalia with gonocoxites widely separated; aedeagus and parameres symmetrical; surstylus longer than epandrium and carrying single terminal tenaculum on the surstylus.

**Remarks.** Apart from *Feuerborniella*, two other genera of Psychodini taxa have a fleshy labellum and a single terminal tenaculum of the surstylus. *Nielsenella* Vaillant, 1971 has asymmetric aedeagus and parameres, setae on the wing membrane and often one of the posterior branches of the ascoids reduced (as in *Threticus* Eaton, 1904). The Neotropical/Nearctic *Quatiella* Botosaneanu & Vaillant, 1970 is separated from *Feuerborniella* on the gonocoxites touching medially and the surstyli being as short as or shorter than the tenacula they carry.

**Species included.** *F. amblytes* (Quate, 1999), *F. ancepitis* (Quate, 1996), *F. bicuspis* (Quate, 1996), *F. ensiger* (Quate, 1996) comb. nov., *F. hamata* (Quate, 1996), *F. longistylus* (Quate, 1996) comb. nov., *F. morogorica* Wagner & Andersen, 2007 comb. nov., *F. obscura* (Tonnoir, 1919), *F. pandiculata* (Quate, 1996), *F. plaumanni* (Duckhouse, 1968), *F. retusus* (Quate, 1996), *F. sinefurcata* sp. nov., *F. spathipenis* (Duckhouse, 1968), *F. veracruzana* Ibáñez-Bernal, 2004.

### *Feuerborniella obscura* (Tonnoir, 1919)

Fig. 1

*Psychoda obscura* Tonnoir, 1919: 140.

*Psychoda eximia* Feuerborn, 1923: 200.

*Philosepedon uniretinacleum* Krek, 1971: 92.

**Material examined. Lectotype** female. “Uccle Av. Defré, 21. Mai 1917, A. Tonnoir”. Designated by J. Ježek (1985). 3 female paralectotypes, one with the same data as holotype, two from “Forêt Soignes, 3 Juin 1918, A. Tonnoir”. All in coll. [RBINS]. BELGIUM: “Linkebeek, 26.V.[19]20, A. Tonnoir”, 2 females (RBINS). “Falaën, Juin [19]21, A. Tonnoir”, 1 male [RBINS]. “Ohain, 23.V.[19]20, R. Mayné”, 2 females [RBINS]. GERMANY: Hessen, Vogelsbergkreis, Schlitz, 13.VI.1971, R. Wagner leg. 1 male. [RW]

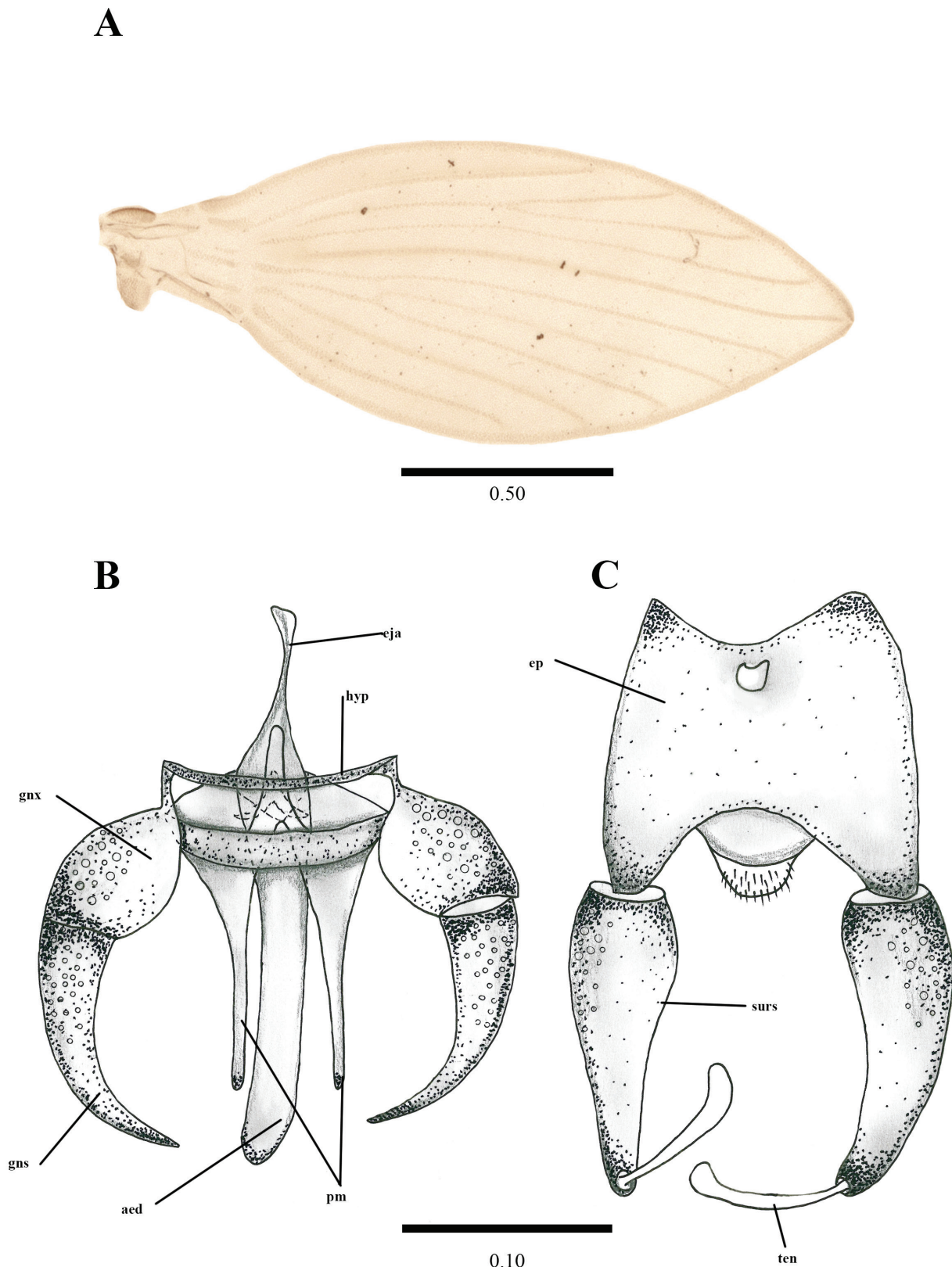
**Diagnosis.** *Feuerborniella obscura* can be separated from other described species of *Feuerborniella* by the following combination of characters: Wing forks complete, ejaculatory apodeme narrow, parameres dorsally connected, with elongate projections reaching apical 1/5 of aedeagus, aedeagus without subapical constriction.

**Re-description.** Measurements in mm (n = 1). Wing length 1.63, width 0.65; Head length 0.30, width 0.32; Antennal segments, scape: 0.06, pedicel: 0.04, flagellomere 1-9 0.10; Palpomeres 1: 0.06, 2: 0.08, 3: 0.10, 4: 0.12.

**Male.** Head about the same length as width, vertex about 1/3 of head length; eyes separated by 2 facet diameters, eye bridge with four facet rows, interocular suture as an inverted Y, length of suture about 2 facet diameters. Antennal scape about the same length as width, subquadrate; pedicel spherical, about the same length of scape, flagellomeres vaguely asymmetrical and nodiform, nodes progressively decreasing in size and internode increasing in length up to apical flagellomeres which are reduced in size and globular, not fused; ascoids with one anterior branch and to posterior branches, Y-shaped; frontal alveoli patch undivided, anterior margin extending almost to interocular suture reaching the second facet; labella bulbous, setose, without teeth. Palpal segments sclerotised, palpal proportions 1.0:1.4:1.7:2.1.

Wing hyaline, except costal cell which is infuscated; wing length 2.8 times its width; Sc short ending at the base of R<sub>1</sub>; Radial fork apical to Medial fork, M<sub>2</sub> not connected to M<sub>1</sub>; R<sub>5</sub> looks more sclerotised than the rest of wing veins, ending at wing apex.

**Terminalia.** Hypandrium sclerotised and plate-like; gonocoxites about the same length of gonostylus, cylindrical; gonostylus simple, tapering towards apex, incurved. Aedeagus symmetrical, extending towards the apex of gonostylus, parameres with a broad triangular base, tapering towards the apex, connected by a bridge morphologically ventral to the aedeagus, out-curved, ejaculatory apodeme narrow. Epandrium about the same length as its width, with both anterior and posterior margins concave; surstylus conical, tapering towards the apex



**Figure 1.** *Feuerborniella obscura* **A.** Wing; **B.** Genitalia, aedeagus, gonocoxites, gonostyli; **C.** Genitalia, epandrium and surstyli. Scales in millimetres (mm). Abbreviations: aed: aedeagus; eja: ejaculatory apodeme; ep: epandrium; gns: gonostyli; gnx: gonocoxite; hyp: hypandrium; pm: paramere; surs: surstyli; ten: tenaculum.

with a single spatulate tenacula, about half the length of surstylus; Hypoproct with posterior margin rounded, subquadrate, covered in small setulae.

**Remarks.** The description is based on the male from Germany; the other specimens listed under “material examined” have been consulted only to confirm the ge-



neric diagnosis. Previous re-descriptions of *F. obscura* by Vaillant (1971), Ježek (1985) and Krek (1999) show some discrepancies in whether the ascoids have a posterior branch or not. Vaillant (1974) describes the ascoids as Y-shaped (i.e. three branches) on the first ten flagellomeres and as either Y-shaped or V-shaped on the following flagellomeres. Ježek (1985) describes and figures the ascoids as possessing two branches, similar to Vaillant's (1974) illustration of the V-shaped condition. Krek (1999) figures three branches and lists the ascoids as Y-shaped, not mentioning any V-shaped ascoids on the distal flagellomeres at all. We deem it likely that this is a variable character as described by Vaillant (1974).

***Feuerborniella morogorica* (Wagner & Andersen, 2007), comb. nov.**

*Psychoda morogorica* Wagner & Andersen, 2007: 293.

**Diagnosis.** *Feuerborniella morogorica* can be separated from all other *Feuerborniella* species by the following combination of characters: Forks complete, ejaculatory apodeme narrow, parameres not reaching beyond gonocoxites, aedeagus without subapical constriction.

**Remarks.** *Feuerborniella morogorica* is transferred to *Feuerborniella*, based on the labellum bulbous, aedeagus symmetric with symmetric parameres, gonocoxites widely separate and surstylus with a single tenaculum.

***Feuerborniella sinefurcata* sp. nov.**

<https://zoobank.org/1D5795FC-48BB-4ECF-9022-C81AB1F8B304>

Fig. 2

**Type material.** *Holotype* male. TANZANIA: Tanga Region, West Usambara Mountains, Mazumbai Forest Reserve, "Loc G & F". 2–6.XI.1990 (Malaise trap), "ZMBs Tanzania Expedition" leg. [ZMBN].

**Diagnosis.** *Feuerborniella sinefurcata* can be separated from all other *Feuerborniella* species by the following combination of characters: Wing forks incomplete, ejaculatory apodeme narrow, parameres separated, reaching apical 1/5 of aedeagus, aedeagus without subapical constriction.

**Description.** Measurements in mm (n = 1). Wing length 1.50, width 0.63; head length 0.28, width 0.29; Antennal segments, scape: 0.06, pedicel: 0.04, flagellomere 1-3: 0.09; Palpomeres 1: 0.04, 2: 0.08, 3: 0.08, 4: 0.11.

**Male.** Holotype. Head about the same length as width, vertex about 1/3 of head length; eyes separated by approximately 1.5 facet diameters, eye bridge with 4 facet rows, interocular suture angular arch-shaped. Antennal scape about the same length as width, subquadrate; pedicel spherical, about the same length of scape, flagellomeres asymmetrical and nodiform, apical flagellomeres missing in revised material. Ascoids are absent

in the revised material. Frontal alveoli patch undivided, anterior margin extending almost to interocular suture reaching the second facet; labella bulbous, setose, without teeth. Palpal segments sclerotised, palpal proportions 1.0:1.6:1.7:2.5.

Wing hyaline, except costal cell which is infuscated; wing length 2.6 times its width; Sc short ending at the base of R<sub>1</sub>; Radial fork apical to Medial fork, R<sub>2</sub> not connected to R<sub>1</sub>, M<sub>2</sub> not connected to M<sub>1</sub>; R<sub>3</sub> looks more sclerotised than the rest of wing veins, ending at wing apex.

**Terminalia.** Hypandrium narrow, sclerotised, and plate-like; gonocoxites about half the length of gonostylus, cylindrical; gonostylus simple, tapering towards apex, incurved. Aedeagus extending towards the apex of gonostylus, parameres triangular-broad base, tapering towards the apex, weakly curved laterad, not connected by a bridge; ejaculatory apodeme narrow, about half the length of aedeagus. Epandrium about the same length as its width, with both anterior and posterior margins concave; surstylus cylindrical, slightly tapering towards the apex with a single spatulate tenaculum, about half the length of surstylus; Hypoproct with posterior margin rounded, tongue-shaped, covered in small setulae.

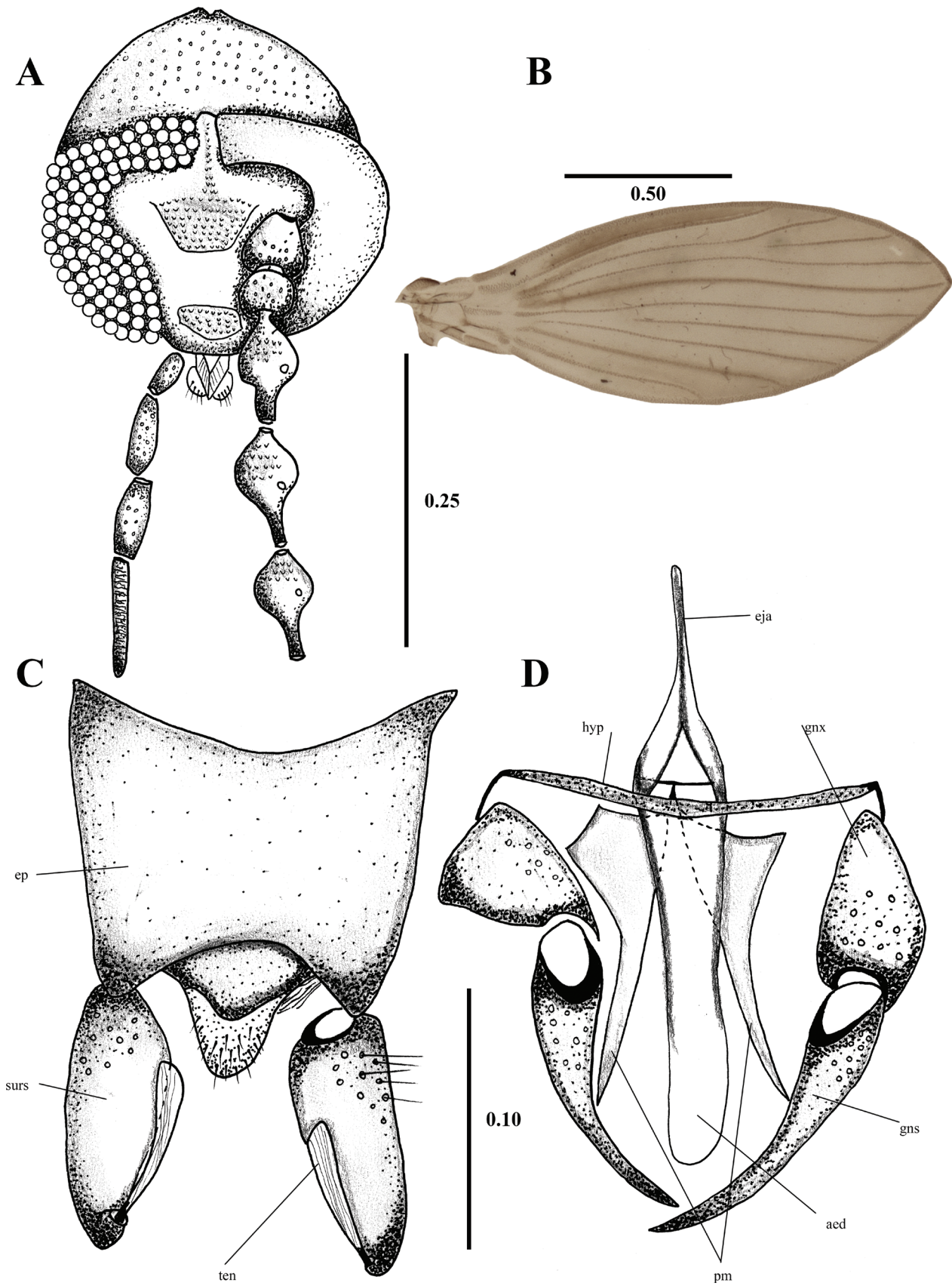
**Etymology.** From Latin *sine*, meaning without and, *furca*, meaning fork – referring to the reduced radial and medial forks in the new species.

**Remarks.** *Feuerborniella sinefurcata* sp. nov. is the 19<sup>th</sup> species of Psychodidae to be described from the West Usambara Mountains (see Kvifte (2022)) and the second Afrotropical species of *Feuerborniella*.

## Discussion

Vaillant (1974) recognised four species in his first review of *Feuerborniella*, spanning the Neotropical, Palearctic and Oriental Regions. Ježek (1985) considered *Psychoda plaumanni* Duckhouse, 1968 and *Psychoda spathipennis* Duckhouse, 1968 to belong to his genera *Psycha* Ježek, 1983 and *Psychomora* Ježek, 1983 and considered *Trichopsychoda malayensis* Satchell, 1955 to belong to an undescribed genus. Neither these changes nor his transfer of the Oriental *Psychoda nigripennis* Brunetti, 1908 to *Feuerborniella* were supported by mention of specific morphological characters and they have generally not been considered in subsequent works.

Ibáñez-Bernal (2004) followed Vaillant's (1974) initial species list and added an additional Neotropical species, lifting the world total to five and Cordeiro et al. (2014) recognised six species with their description of *F. paramuna*. Many additional combinations were made by Cordeiro et al. (2015), but since their diagnosis is not consistent with the type species of *Feuerborniella*, the validity of these combinations must be considered on a case-by-case basis.



**Figure 2.** *Feuerborniella sinefurcata* sp. nov. **A.** Head; **B.** Wing; **C.** Genitalia, epandrium and surstyli; **D.** Genitalia, aedeagus, gonocoxites, gonostyli. Scales in millimetres (mm). Abbreviations: aed: aedeagus; eja: ejaculatory apodeme; ep: epandrium; gns: gonostyli; gnx: gonocoxite; hyp: hypandrium; pm: paramere; surs: surstyli; ten: tenaculum.

Our current diagnosis adds the criteria of wing membranes without pilosity and symmetry in the male genitalia to previously-published diagnoses. This excludes the Oriental *Trichopsychoda malayensis* Satchell, 1955 and the Neotropical *Feuerborniella pilosella* Cordeiro & Bravo, 2015 and *F. paramuna* Cordeiro, 2014, which would all be *Feuerborniella* species, based on the diagnoses of Ibáñez-Bernal (2004) and Cordeiro et al. (2014). These species all have pilose wing membranes and (based on illustrations) an asymmetric aedeagus; in the case of *F. pilosella*, the parameres are asymmetric as well. According to the differential diagnosis given above, these may belong to *Nielsenella*; however, it would be premature to transfer the species to that genus until the generic limits of *Nielsenella* are re-assessed, based on study of the type species. *Psychoda nigripennis* Brunetti, 1908, which was placed in *Feuerborniella* by Ježek (1985), was insufficiently described in its original description and only a damaged collection of females remained of the type series when it was revised by Quate (1962). That species can, therefore, not be confidently placed in any genus. Of the 14 described species considered by us to form part of *Feuerborniella*, eleven are Neotropical, one is Palearctic and two are Afrotropical. With the high number of undescribed *Feuerborniella* species encountered in the Zurquí project, we suggest the genus to have its highest diversity in the Neotropical Region (Borkent et al. 2018; Brown et al. 2018).

The present paper represents the first mentions of *Feuerborniella* from the Afrotropical Region, which means existing keys will have to be emended. In Kvitte's (2015) key to Afrotropical genera of Psychodini, *Feuerborniella* keys to couplet 6 where neither of the two options work (surstylus with two tenacula vs. surstylus with three or more tenacula). The same is the case for Kvitte and Wagner (2017) where *Feuerborniella* keys to couplet 29 which uses the same character. *Feuerborniella* can be separated from all other Afrotropical Psychodini by the labellum being bulbous rather than flat and the surstylus carrying one tenaculum only.

## Acknowledgements

We are grateful to Trond Andersen for organising the expedition to the West Usambara Mountains and to him and Rüdiger Wagner for giving us access to collections in their care. Maurice Leponce at the Royal Belgian Institute of Natural Sciences kindly facilitated GMK's visit to the RBINS where he examined Tonnoir's type material of *Feuerborniella obscura*. Santiago Jaume-Schinkel's work on European Psychodidae is supported by the Bundesministerium für Bildung und Forschung, Berlin, Germany, the project "German Barcode of Life III: Dark Taxa" (FKZ 16LI1901A). We extend our gratitude to Morgane A. Kerdoncuf for opening her flat to SJS during his stay at Bergen. Danilo Cordeiro, Sergio Ibáñez-Bernal and an anonymous reviewer offered constructive

criticisms of an earlier version of the manuscript, which we found very helpful in improving the scientific merit of this work. We are indebted to the Museum für Naturkunde, Berlin, for waiving the author's fees for this manuscript.

## References

- Borkent A, Brown BV, Adler PH, Amorim Dd S, Barber K, Bickel D, Boucher S, Brooks SE, Burger J, Burington ZL, Capellari RS, Costa DNR, Cumming JM, Curler G, Dick CW, Epler JH, Fisher E, Gaimari SD, Gelhaus J, Grimaldi DA, Hash J, Hauser M, Hippa H, Ibáñez-Bernal S, Jaschhof M, Kameneva EP, Kerr PH, Korneyev V, Korytkowski CA, Kung GA, Kvitte GM, Lonsdale O, Marshall SA, Mathis W, Michelsen V, Naglis S, Norrbom AL, Paiero S, Pape T, Pereira-Colavite A, Pollet M, Rochefort S, Rung A, Runyon JB, Savage J, Silva VC, Sinclair BJ, Skevington JH, Stireman Iii JO, Swann J, Thompson FC, Vilkamaa P, Wheeler T, Whitworth T, Wong M, Wood DM, Woodley N, Yau T, Zavortink TJ, Zumbado MA (2018) Remarkable fly (Diptera) diversity in a patch of Costa Rican cloud forest: Why inventory is a vital science. *Zootaxa* 4402(1): 53–90. <https://doi.org/10.11646/zootaxa.4402.1.3>
- Botosaneanu L, Vaillant F (1970) Trois Dipteres Psychodidae nouveaux 'de Cuba. *Travaux du Laboratoire d'hydrobiologie et de pisciculture de l'Université de Grenoble* 61, 173–183.
- Brown BV, Borkent A, Adler PH, Amorim Dd S, Barber K, Bickel D, Boucher S, Brooks SE, Burger J, Burington ZL, Capellari RS, Costa DNR, Cumming JM, Curler G, Dick CW, Epler JH, Fisher E, Gaimari SD, Gelhaus J, Grimaldi DA, Hash J, Hauser M, Hippa H, Ibáñez-Bernal S, Jaschhof M, Kameneva EP, Kerr PH, Korneyev V, Korytkowski CA, Kung GA, Kvitte GM, Lonsdale O, Marshall SA, Mathis W, Michelsen V, Naglis S, Norrbom AL, Paiero S, Pape T, Pereira-Colavite A, Pollet M, Rochefort S, Rung A, Runyon JB, Savage J, Silva VC, Sinclair BJ, Skevington JH, Stireman Iii JO, Swann J, Thompson FC, Vilkamaa P, Wheeler T, Whitworth T, Wong M, Wood DM, Woodley N, Yau T, Zavortink TJ, Zumbado MA (2018) Comprehensive inventory of true flies (Diptera) at a tropical site. *Communications Biology* 1(1): 21. <https://doi.org/10.1038/s42003-018-0022-x>
- Brunetti E (1908) Indian Psychodidae. *Records of the Indian Museum* 2: 369–384. <https://doi.org/10.26515/rzsi/v2/i4/1908/163354>
- Cordeiro D, Bravo F, Wolff M, Carvalho CJBd (2014) A new species of *Feuerborniella* (Diptera: Psychodidae) from the paramo of Colombia. *Acta Entomologica Musei Nationalis Pragae* 54: 377–382.
- 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.
- Duckhouse DA (1968) Psychodidae (Diptera, Nematocera) collected by Mr. Plaumann in Southern Brazil. *The Proceedings of the Royal Entomological Society of London (B)* 37(3–4): 29–40. <https://doi.org/10.1111/j.1365-3113.1968.tb00193.x>
- Eaton AE (1904) New genera of European Psychodidae. *Entomologist's Monthly Magazine* 40: 55–59.
- Feuerborn HJ (1923) Die Larven der Psychodiden oder Schmetterling-smücken. Ein Beitrag zur Oekologie des „Feuchtell“. *Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte*



- Limnologie, Kiel, Stuttgart, 1 (1922), 181–213. <https://doi.org/10.1080/03680770.1923.11896457>
- Ibáñez-Bernal S (2004) A new species of the genus *Feuerborniella* Vaillant, from Mexico (Diptera: Psychodidae). *Zootaxa* 412(1): 1–8. <https://doi.org/10.11646/zootaxa.412.1.1>
- Ježek J (1985) Contribution to the knowledge of a new subtribe Trichopsychodina (Diptera, Psychodidae) from Czechoslovakia. *Sborník Národního Muzea* 40B: 65–92.
- Ježek J, Le Pont F (2016) Psychodidae (Diptera) of New Caledonia: Checklist and description of a new genus and species. *Acta Entomologica Musei Nationalis Pragae* 56: 813–826.
- Krek S (1971) Description de cinq espèces nouvelles de Psychodidae de Yougoslavie (Diptera). *Bollettino Associazione Romana di Entomologia* 25(4): 87–95.
- Krek S (1999) Psychodidae (Diptera: Insecta) Balkanskog Poluotoka. *Studentska Stamparija Univerziteta Sarajevo, Sarajevo*, 417 pp.
- Kvifte GM (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: 115–126. <https://doi.org/10.11646/zootaxa.3986.1.6>
- Kvifte GM (2019) New records of Norwegian Psychodidae, with the first description of the female of *Trichosepedon balkanicum* (Krek, 1970) comb.nov. *Norwegian Journal of Entomology* 66: 1–10.
- Kvifte GM (2022) Description of *Perithreticus neglectus* sp. n. from the West Usambara Mountains, Tanzania (Diptera, Psychodidae). *Biodiversity Data Journal* 10: e81205. <https://doi.org/10.3897/BDJ.10.e81205>
- Kvifte GM, Wagner R (2017) Psychodidae (Sand Flies, Moth Flies or Owl Flies) In: Kirk-Spriggs AH, Sinclair BJ (Eds) *Manual of Afrotropical Diptera. Vol. 2. Nematoceros Diptera and lower Brachycera. Suricata 5*. South African National Biodiversity Institute, Pretoria. 607–632.
- Kvifte GM, Curler GR, Marshall SA (2018) Aquatic insects in the forest canopy: a new genus of moth flies (Diptera: Psychodidae) developing in slime on aerial roots. *Journal of Natural History* 52(3–4): 137–153. <https://doi.org/10.1080/00222933.2017.1410590>
- Quate LW (1955) A revision of the Psychodidae (Diptera) in America North of Mexico. *University of California Publications in Entomology* 10: 103–273.
- Quate LW (1962) Psychodidae (Diptera) at the Zoological Survey of India. *Proceedings of the Hawaiian Entomological Society* 18: 155–188.
- Quate LW (1996) Preliminary taxonomy of Costa Rican Psychodidae (Diptera), exclusive of Phlebotominae. *Revista de Biología Tropical* 44(supplement 1): 1–81.
- Quate LW (1999) Taxonomy of Neotropical Psychodidae (Diptera) 3. Psychodines of Barro Colorado Island and San Blas, Panama. *Memoirs on Entomology International* 14: 409–441.
- Satchell GH (1955) The genus *Trichopsychoda* Tonnoir (Diptera: Psychodidae). *Proceedings of the Royal Entomological Society of London* 24: 49–57. <https://doi.org/10.1111/j.1365-3113.1955.tb01474.x>
- Tonnoir AL (1919) Contribution à l'étude des Psychodidae de Belgique. Note préliminaire. *Annales de la Société Entomologique de Belgique* 59: 8–17.
- Vaillant F (1971) Psychodidae - Psychodinae. In: Lindner E (Ed.) *Die Fliegen Der Palearktischen Region. Lieferung 287*. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, 1–48.
- Vaillant F (1974) Psychodidae - Psychodinae. In: Lindner E (Ed.) *Die Fliegen Der Palearktischen Region. Lieferung 305*. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, 109–142.
- Wagner R, Andersen T (2007) Psychodidae (Diptera: Nematocera) from the West Usambara Mountains, Tanzania. In: Andersen T (Ed.) *Contributions to the Systematics and Ecology of Aquatic Diptera - A Tribute to Ole A. Sæther*. Caddis Press, Columbus, Ohio, 287–307.