

**The tiniest of the spongillaflies: *Sisyborina arrietty* sp. nov. from Senegal
(Neuroptera: Sisyridae)**

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Abstract – A new species of *Sisyborina* Monserrat, 1981 (Neuroptera: Sisyridae), *Sisyborina arrietty* sp. nov., is described from Senegal, representing the first record of the family from the country. With a body length of 1.6–1.8 mm and fore wing length of 2.4–2.5 mm, the new species is the smallest known representative of Sisyridae. An identification key is provided for the males of known *Sisyborina* species.

Key words – taxonomy, new species, Afrotropical Region, aquatic insect

INTRODUCTION

Sisyborina Monserrat, 1981 is an endemic Afrotropical genus of spongillaflies (Neuroptera: Sisyridae), hitherto represented by two species (TJEDER 1976, MONSERRAT 1981, FLINT 2012). *Sisyborina marlieri* (Tjeder, 1976), originally described in combination with *Sisyryna* Banks, 1939 (TJEDER 1976), was the first representative of the genus. MONSERRAT (1981) found significant differences in the male and female genital segments between this species and the other two species of *Sisyryna* which were known that time (namely, *Sisyryna nirvana* Banks, 1939 and *Sisyryna tropica* Smithers, 1973), as already pointed out by TJEDER (1976) in the original description of the species. Thus, MONSERRAT (1981) established the genus *Sisyborina* Monserrat, 1981, and proposed the transfer of *Sisyryna marlieri*, designated as the type species of *Sisyborina* (MONSERRAT 1981, YANG & LIU 2021, ASSMAR *et al.* 2022). *Sisyborina marlieri* has been reported from the Democratic Republic of the Congo and Nigeria (TJEDER 1976). The second species of the genus, *Sisyborina scitula* Flint, 2012 was described from Cameroon, Guinea and Zambia (FLINT 2012). Since then, no further distributional records of these species have been published.

The identification progress of the spongillafly material of the Biological Museum of Lund University (MZLU) by the author resulted in a newly described species from the Afrotropical Region (Senegal). The identification was based on the original descriptions of the genus and included species (TJEDER 1976, MONSERRAT 1981, FLINT 2012), and on YANG & LIU (2021), and ASSMAR *et al.* (2022). The type material of the new species was also compared to the paratype of *Sisyborina marlieri* (deposited in the MZLU). This paper provides the description of the third species of *Sisyborina*; *Sisyborina arrietty* sp. nov. is the smallest spongillafly species known so far. It also represents the first record of the family from Senegal.

Morphological terminology in the species description follows ASPÖCK (2002), ASPÖCK & ASPÖCK (2008), and BREITKREUZ *et al.* (2017). Specimens were identified by the author, using a Nikon SMZ800 stereomicroscope. Label data of the specimens are given verbatim with explanatory information in square brackets; the symbol “//” marks the separation of labels.

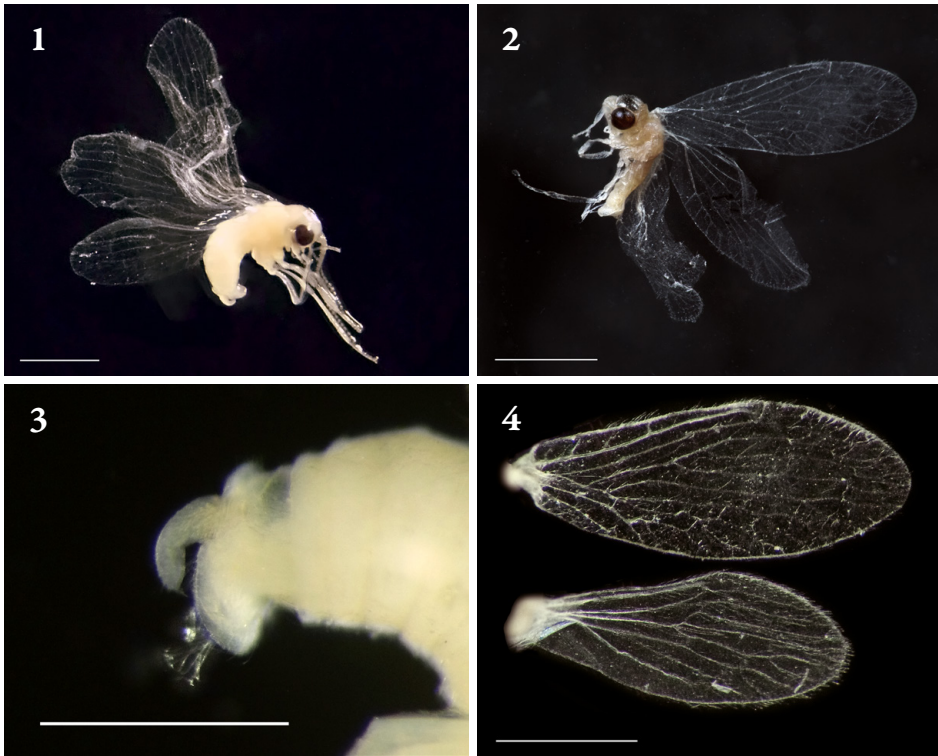
TAXONOMY

Sisyborina arrietty sp. nov.

(Figs 1–7)

Type material – Holotype: male, “Senegal, 1 km NW Bignona 26 km [or 28, label is damaged in this part] N Ziguinchor. At light 19.25–20.30 [hours]. 3.III.1977 Loc. No. 14. UTM 28PCK654170 // Lund Univ. Syst. Dept. Sweden–Gambia/Senegal Febr.-March 1977 [leg.] Cederholm-Danielsson-Larsson-Norling-Samuelsson // Senegal, loc 14 4.3.77 på ljus [= at light]”; specimen is preserved in 70% ethyl alcohol (Figs 1, 3). Paratype: male, “Senegal, village Saré Sara 21 km ESE Kolda, at light 19.00–21.00 [hours] 6.III.1977 Loc. No. 19. UTM 28PEK266191 // Lund Univ. Syst. Dept. Sweden Gambia/Senegal Febr.-March 1977 [leg.] Cederholm-Danielsson-Larsson-Mireström-Norling-Samuelsson”; specimen is preserved in 70% ethyl alcohol (Figs 2, 4). The holotype is deposited in the MZLU, the paratype in the Hungarian National Museum Public Collection Centre – Hungarian Natural History Museum, Budapest (HNHM).

Diagnosis – The new species can be identified by the combination of the following character states: conspicuously small, body 1.6–1.8 mm, fore wing 2.4–2.5 mm, hind wing 2.2–2.3 mm long; wings immaculate; gonocoxite 9 with a few, long, weak setae on its distal part, proximally wide, abruptly narrowed at about midlength, then subparallel towards the truncate apex, length of gonocoxite 9 in profile as long as two thirds of sternite 9; sternite 9 in dorsal view shallow plate-shaped, wider than long, margins upturned, with tiny, pale setae proximally, and with two symmetric, characteristic fringes on distal margin, consisting of 8–10 straight, enlarged, translucent setae of the same length.



Figs 1–4. *Sisyborina arrietty* sp. nov., 1 = holotype, 2 = paratype, 3 = genital segments of the holotype, 4 = wings of the paratype. Scale bars = 1 mm (Figs 1–2, 4) and 0.5 mm (Fig. 3)
(photos by Viktória Szőke)

Description – Male (Figs 1–7).

Adult: Body length 1.6–1.8 mm. Head with sparse, pale, thin and weak setae. Eyes bronze-coloured. Head entirely pale yellowish white, including clypeus, labrum, and palpi. Distal segment of maxillary palpus elongate triangular, apically pointed and sharp-edged. Antenna translucent, pale yellowish white (a few apical flagellomeres missing); scape elongate conical, both scape and pedicel longer than wide; flagellomeres quadrate, first flagellomere smaller than following ones. Pronotum pale yellowish white, its lateral edges rounded, and with sparse, pale, thin and weak setae. Mesonotum and metanotum pale yellowish white, without setae. Abdominal segments weakly sclerotised, without setae; tergites, sternites, and genital segments pale yellowish white (Figs 1–3).

Fore wing (Figs 1–2, 4–5): Length 2.4–2.5 mm. Wing membrane translucent, without maculae, pterostigma and veins whitish, with pale setae along longitudinal veins. Subcostal veinlets (c-sc) proximal to pterostigma varying in number from seven to ten. Sc ends at pterostigma, bends towards RA. RA forked at wing margin. RP with four main branches (i.e., with three main bifurcations), forked at wing margin. MA and MP both with two branches. CuA with four branches at wing margin. CuP weakly curved, forked at wing margin. Fore wing with two anal veins, A2 bent. Crossveins: one proximal sc-ra; three ra-rp; one rp1-rp2; one rp2-rp3; two rp3-rp4; one rp4-ma; one ma-mp proximal to the bifurcation of MA but distal to the bifurcation of MP; two mp-cua; one cua-cup; one cup-a1; one a1-a2. The series of outer gradate crossveins runs under the pterostigma.

Hind wing (Figs 1–2, 4–5): Length 2.2–2.3 mm. Colouration as of fore wing, not paler. With pale setae along longitudinal veins. One or two subcostal veinlets (c-sc) at proximal part of wing. Sc ends at pterostigma, fuses with RA. RA with a few, thin branches at wing margin. RP with four main branches (i.e., with three main bifurcations), forked at wing margin. MA and MP both with two branches, forked at wing margin. CuA with four thin branches at wing margin. CuP weakly curved, not forked. Hind wing with two, barely visible, not forked anal veins. Crossveins: two ra-rp; one rp1-rp2; one rp2-rp3; one rp3-rp4; two rp4-ma; one ma-mp proximal to the bifurcation of MA but distal to the bifurcation of MP; one mp-cua (distal to the bifurcation of MP); one cua-cup and cup-a1.

Legs (Figs 1–2): Pale yellowish white, translucent; claws brownish, simple, bent.

Male genitalia (Figs 3, 6–7): Gonocoxite 9 pale yellowish white with a few, long, weak setae on its distal part; proximally wide, abruptly narrowed at about midlength, then subparallel towards the truncate apex; gonocoxites 9 bent towards each other; length of gonocoxite 9 in profile as long as two thirds of sternite 9. Gonocoxite 11 rounded with tiny, whitish setae along its margin. Sternite 9 pale yellowish white; in dorsal view shallow plate-shaped, wider than long, margins upturned, with tiny, pale setae proximally, and with two symmetric, characteristic fringes on distal margin, consisting of 8–10 straight, enlarged, translucent setae of the same length. Ectoproct pale yellowish white.

Female: Unknown.

Larva: Unknown.

Distribution – Western Africa, Senegal.

Etymology – The new species is named after Arrietty, main character of Studio Ghibli's animated movie entitled *The Secret World of Arrietty* (in the translation of the original Japanese title "Arrietty the Borrower") (2010), directed by Hiromasa Yonebayashi, written by Hayao Miyazaki and Keiko Niwa based on Mary Norton's novel titled "The Borrowers" from 1952. The specific epithet refers to the size of the new species: it is the smallest of all known spongillafly species; proper noun in apposition, ending not to be changed.

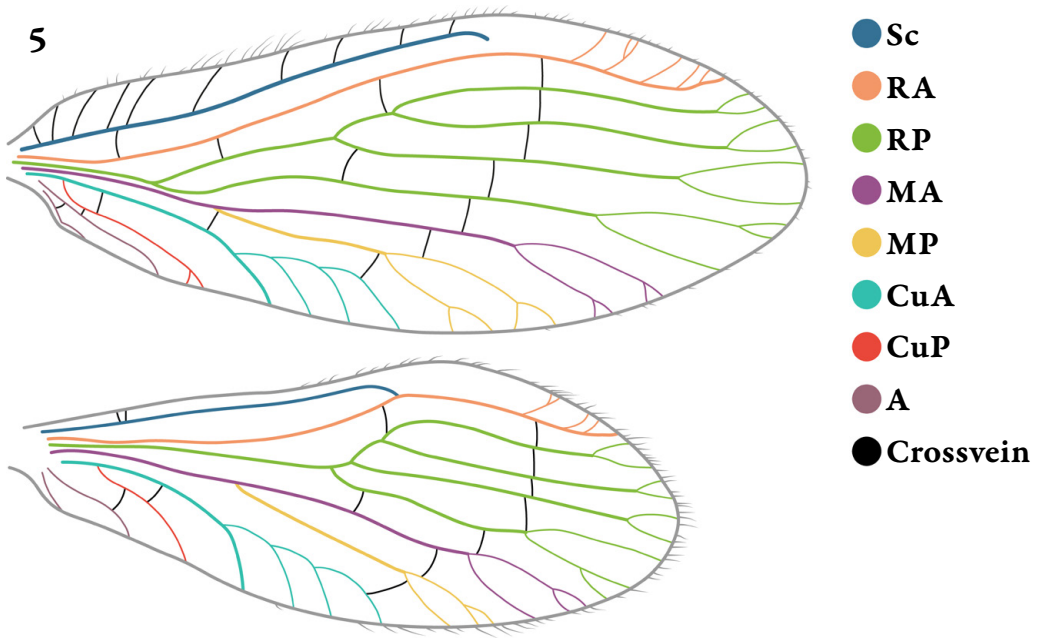
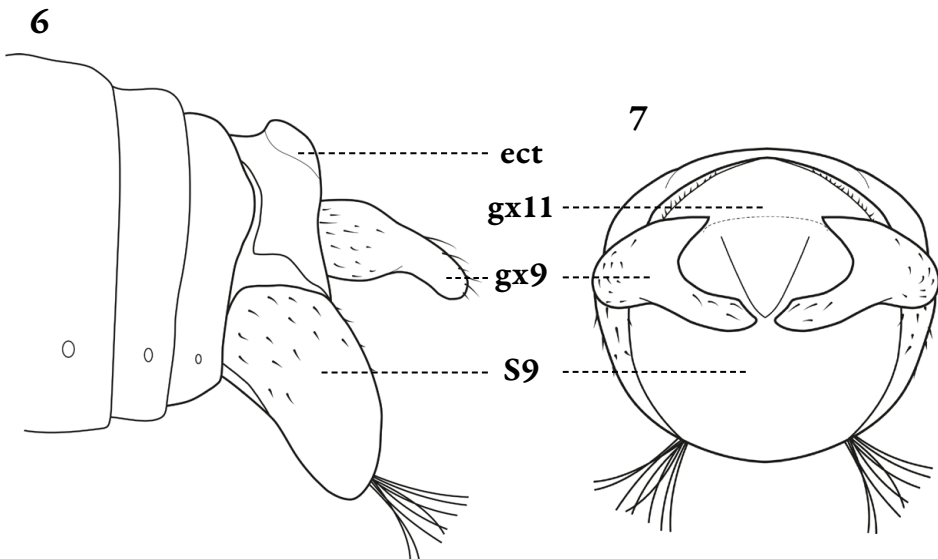


Fig. 5. Wing venation of *Sisyborina arrietty* sp. nov. (drawings by Viktória Szóke)



Figs 6–7. Male genitalia of *Sisyborina arrietty* sp. nov., 6 = in lateral view, 7 = in dorsocaudal view. Abbreviations: ect = ectoproct, gx11 = gonocoxite 11, gx9 = gonocoxite 9, S9 = sternite 9 (drawings by Viktória Szóke)

Remarks on generic placement – The new species matches the diagnostic characteristics of the genus *Sisyborina*: the enlarged distal segment of maxillary palpus, the presence of epicranial sulcus on vertex, the presence of series of outer gradate crossveins on fore and hind wings and two rp3-rp4 crossveins on fore wings, and the large sternum 9 of male genitalia (MONSERRAT 1981, YANG & LIU 2021, ASSMAR *et al.* 2022). *Sisyborina* can be readily distinguished from *Sisyrina*, the most similar genus of the family, by the large sternum 9 of male genitalia and the triangular-shaped tergite 9 of female genitalia (MONSERRAT 1981, YANG & LIU 2021). *Sisyborina arrietty* sp. nov. is the first known species of the genus without maculae on wings (Figs 1–2, 4); nevertheless, most other extant Sisyridae genera include species with and without maculae on wings.

Remarks on identification – The new species differs from the two congeners in the male genitalia (Figs 3, 6–7), immaculate wings (Figs 1–2, 4), and its conspicuously small size. Male genitalia of *Sisyborina marlieri* differ from the new species in the shape of gonocoxite 9, the presence of strong, curved hairs and spines on gonocoxite 9, the absence of fringes on sternite 9, and by the relative sizes of gonocoxite 9 and sternite 9 in profile (cf. TJEDER 1976: figs 3, 6). Male genitalia of the new species are somewhat similar to those of *Sisyborina scitula*; however, the latter species can be easily distinguished from the new species by the presence of a row of 5–6 enlarged setae on the dorsomesal surface of gonocoxite 9 and the presence of apical tooth on gonocoxite 9 (cf. FLINT 2012: figs 5–6); additionally, sternite 9 is longer than wide in *Sisyborina scitula* (cf. FLINT 2012: fig. 7). Both previously described species have maculate wings (cf. TJEDER 1976: figs 1–2, FLINT 2012: fig. 9), contrasting with the immaculate wings found in the new species (Figs 1–2, 4), and bodies of the other two species are about one third larger than that of the new species (TJEDER 1976, FLINT 2012). The colouration of the new species is apparently also paler than that of the other two species (Figs 1–2); however, due to preservation, the type material of the new species could be somewhat paler than living individuals or fresh specimens. Thus, the colouration of the body is treated only as a supporting, not a distinguishing character. For practical purpose, a simplified identification key to the males of *Sisyborina* species is presented below.

- 1 Gonocoxite 9 with a few weak setae on its distal part, without spines and apical tooth; sternite 9 with two symmetric, characteristic fringes on distal margin, consisting of 8–10 straight, enlarged, translucent setae of the same length, sternite 9 in dorsal view wider than long; fore wing without maculae, pterostigma whitish *Sisyborina arrietty* sp. nov.
- Gonocoxite 9 with strong setae or spines and with an apical tooth; sternite 9 with or without two symmetric, characteristic fringes on distal margin, if sternite 9 with such fringes, then it is twice longer than wide in dorsal view; fore wing with maculae along crossveins, especially in the subcostal region, pterostigma slightly darkened 2

- 2 Lengths of gonocoxite 9 and sternite 9 subequal in profile; sternite 9 without marginal fringes *Sisyborina marlieri* (Tjeder, 1976)
- Lengths of gonocoxite 9 and sternite 9 different in profile, sternite 9 distinctly longer than gonocoxite 9; sternite 9 with two marginal fringes *Sisyborina scitula* Flint, 2012

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