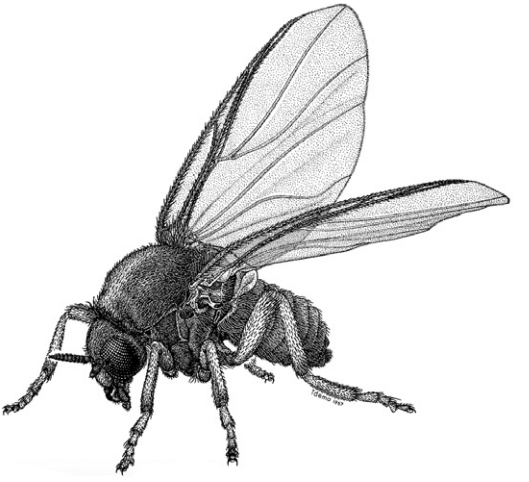
Simuliidae

David López-Peña (1998 Checklist: Rolph Glatthaar)
Last update: Jul 2024

Diagnosis: These nematocerous Diptera are characterised by their small size (3.0-6.0 mm), robust body and generally dark colouration. However, some species can also be brownish, yellowish or orange. Members of this family exhibit sexual dimorphism, with the male having holoptic eyes divided into a dorsal section (large eye facets) and a ventral section (small eye facets), while the female's eyes are dichoptic, separated from each other and with the same facet size. Simuliids have a pair of short but broad, membranous and colourless wings, varying in length from 1.4 to 6.0 mm. In addition, the costal (Cs), subcostal (Sc), middle (M), radial (Rs) and first radial (R_1) veins, responsible for maintaining shape and transmitting wing beats, are more robust than the false veins. This wing morphology, combined with significant muscle development, makes them extraordinary flyers. The antennae are usually short and cylindrical and, unlike other Nematocera, with short hairs in both sexes. They are usually made up of eleven segments, although some species have ten and rarely only nine. Another noteworthy feature of this family is the presence of the Lutz organ, which consists of a sensory orifice located in the third segment of the female's maxillary palps. It is used to detect carbon dioxide exhaled by its potential host. In some species, both sexes also have structures on their legs called *calcipala* and *pedisulcus*. The former is a semicircular extension located on the basitarsus of the first tarsomere, while the latter is a notch or groove located at the base of the second tarsomere.

Biology: Many simuliids are univoltine or bivoltine species, although *Simulium* genus includes many multivoltine species. The number of generations per year depends on the geographical distribution and environmental conditions. Females of several species often need to ingest blood for the development and maturation of their eggs, while males and females of other species feed on flower nectar, thus contributing to pollination. From time to time, specimens of some species emerge in very large numbers, aggregating in swarms, which can have major consequences in the case of hematophagous species, since they affect both animals and humans. The immature stages are mainly found in running waters where they live attached to a substratum. The larval stages can vary between seven and eleven instars, depending on the species and environmental conditions. The larvae stand out for their body morphology, the extremities of which are wider than the central area. They also have characteristic structures such as the pseudopod, located in the ventral part of the thorax, the adhesive disc in the last abdominal segment and the anal brachia near the latter. In addition, eye spots or stemmata on both sides of the cephalic capsule allow them to detect light, and a pair of filter fans used for feeding identifies them unequivocally. The pupal stage is very important for species identification and classification, because of the often-unique structures on the pupal case. In the same way, the respiratory structures or gill filaments are key characters for identification. Most keys deal therefore with pupal stages, rather than larval and adult stages. Finally, the eggs have a subtriangular shape that ranges from 0.1 to 0.5 mm. At the time of laying, they are whitish in colour and as they mature and the larva develops inside, they acquire a yellowish-brown colour.



Prosimulium mixtum,
female, not present in Switzerland
(MND1, p. 355).

Nomenclature and classification: According to Adler (2022) with some minor changes.

Number of species: CH: 35 (1998 Checklist: 34),
AT: 51, BE: 22, CZ: 43, DE: 55, ES: 51, FR: 50, IT: 72, LI: 4, NL: 18, PL: 52, PT: 33, SI: 26, SK: 46, Europe: 288, World: 2398.

Level of faunistic knowledge in Switzerland: Good; but it is possible that the number of simuliid species in Switzerland could be increased considering that neighbouring countries have a greater number of species; however, it is difficult to give an estimated number of species that could be present in Switzerland.

General references: Knoz (1965) [key to species of Czechoslovakia], Crosskey (1990) [general], Jedlička & Stloukalová (1997) [general, key to Palaearctic genera], Jedlička et al. (2004) [key to Central European species, pupae], Adler et al. (2004) [general], Roskov et al. (2019) [species catalogue], Adler (2022) [taxonomic and geographical inventory], Kúdela et al. (2022) [keys to larvae and pupae].

References to the Swiss fauna: Glatthaar (1978, 1998).

Checklist

Prosimulium Roubaud, 1906
(*Prosimulium* s.str.)
- *hirtipes* (Fries, 1824) !
- *latimucro* (Enderlein, 1925) !

= *conistylum* auct. nec Rubtsov
- *rufipes* (Meigen, 1830) !
- *tomosvaryi* (Enderlein, 1921) !

Simulium Latreille, 1802
- *canescens* Bremi, 1842 N1

(*Boophthora* Enderlein, 1921)
- *erythrocephalum* (De Geer, 1776) !

(*Eusimulium* Roubaud, 1906)
- *angustipes* Edwards, 1915 !
  = *securiforme* Rubtsov, 1956
- *aureum* (Fries, 1824) L

(*Hellichiella* Rivosecchi & Cardinali, 1975)
- *latipes* (Meigen, 1804) !
  = *subexcisum* Edwards, 1915

(*Nevermannia* Enderlein, 1921)
- *angustitarse* (Lundström, 1911) !
- *bertrandi* Grenier & Dorier, 1959 !
- *carthusiense* Grenier & Dorier, 1959 !
- *costatum* Friederichs, 1920 !
- *crenobium* (Knoz, 1961) !
- *cryophilum* (Rubtsov, 1959) !
- *lundstromi* (Enderlein, 1921) !
  = *latigonium* Rubtsov, 1956
- *quasidecolletum* Crosskey, 1988 L
  = *truncatum* Rivosecchi & Cardinali, 1975
- *vernum* Macquart, 1826 !

(*Obuchovia* Rubtsov, 1947)
- *auricoma* Meigen, 1818 N2

(*Simulium* Latreille, 1802 s.str.)
- *argenteostriatum* Strobl, 1898 !
- *argyreatum* Meigen, 1838 !
  = *rheophilum* Knoz, 1961
- *bezzii* (Corti, 1914) !
- *degrangei* Dorier & Grenier, 1960 !
- *ibariense* Zivkovic & Grenier, 1959 !
- *maximum* (Knoz, 1961) !
- *monticola* Friederichs, 1920 !
- *noelleri* Friederichs, 1920 !
  = *argyreatum* auct. (incl. Rothfels, 1979) nec Meigen
- *ornatum* Meigen, 1818 !
- *reptans* (Linnaeus, 1758) !
- *trifasciatum* Curtis, 1839 !
  = *spinosum* Doby & Deblock, 1957
- *tuberosum* (Lundström, 1911) ? N3
- *variegatum* Meigen, 1818 !

(*Wilhelmia* Enderlein, 1921)

- *equinum* (Linnaeus, 1758) !
- *lineatum* (Meigen, 1804) !

Twinnia Stone & Jamnback, 1955

- *hydroides* (Novák, 1956) !

Excluded species

Simulium lividum (Schellenberg, 1803) N4

Notes

N1 *Simulium* (unplaced subgenus) *canescens* Bremi, 1847: was recorded from Switzerland by Roskov et al. (2019). It was also recorded as « *canescens* Brème, 1842 [in Kölliker] » (among « *Simulium* sensu lato species unplaced to subgenus » in Adler (2022: 130). This species was already mentioned under the name *canescens* Brême, 1842 as « doubtful species » of *Simulium* in Rubzov & Yankovsky (1988). Indeed, there has been continuous confusion about the authors name in the literature and the opportunity is taken here to correct these mistakes. The author of this species is not Brème or Brême or Breme, as can also be found, but the Swiss entomologist J. J. Bremi, as mentioned in the very short original description of « *Simulia canescens* Br. » in Kölliker (1842). Johann Jacob Bremi (1791-1857), whose full name was Johann Jacob Bremi-Wolf, constantly only used the surname Bremi in his publications, was a Swiss entomologist who studied primarily Cecidomyiidae (Diptera) but had interest in many other groups of insects. The description in Kölliker (1842: 11, footnote 2) is preceded by the following sentence « Species novam, cui diligens noster naturae rerum inquisitor turicensis Bremi nomen imposuit, brevi hic describam » [new species for which the thorough researcher of natural history from Zürich Bremi gives the name and shortly describes here]. The description itself which follows is very short (3 lines in Latin). The plate II displays the stages of embryonic development of this species and a figure of the internal anatomy of the larva. However, although the description clearly does not allow to recognize this species, the name is valid according to the ICZN. Bremi's specimens still exist and are housed at ETHZ (Eidgenössische Technische Hochschule Zürich). Future studies of the specimens will reveal if this species can continue to be considered as such or if, on the contrary, it is a synonym of other known species.

N2 *Simulium* (*Obuchovia*) *auricoma* Meigen, 1818: although this species was recorded from Switzerland in the 1998 Checklist (Glatthaar 1998), it was not included in the « World blackflies (Diptera: Simuliidae): A comprehensive review of the taxonomic and geographical inventory [2022] » (Adler 2022) because the entry in Glatthaar's checklist had been overlooked. As a result of this updating, the species will be reported from Switzerland in the next edition of the aforementioned inventory.

N3 *Simulium tuberosum* (Lundström, 1911): was recorded as present in Switzerland in the 1998 Checklist (Glatthaar 1998), however, the presence of this species in several European countries including Switzerland is doubtful, since the name « *tuberosum* » has been widely used across a vast geographic range, with numerous European records actually pertaining to different species of the *tuberosum* species-group. This situation could also occur with the material from Switzerland. Therefore this species must be considered in Switzerland as « *S. tuberosum* (?) » or « *S. tuberosum* complex » until its occurrence in this country is confirmed.

N4 *Simulium lividum* (Schellenberg, 1803): was recorded from Switzerland among « *Simulium* sensu lato species unplaced to subgenus » in Adler (2022: 130). It was originally described as *Hirtaea livida* (Schellenberg & anonymi 1803: 24-27, pl. XXXVIII, figs. 3, f-k), but neither the description nor the figures allow unequivocal recognition of this species. Furthermore, the specimens collected by Schellenberg could not be found by several Swiss museum curators in their museum holdings; therefore, the specimens can tentatively be considered lost, and *S. lividum* can be treated as a nomen dubium. Accordingly, it has been decided that this species is not officially considered in the Swiss checklist, although Martin Rees and Dr. Carl Sagan's quote should be considered: « Absence of evidence does not mean evidence of absence », since although the material cannot be found, Schellenberg's specimens might exist in another collection (although the possibility is remote), and the illustration and the brief description provided by Schellenberg remain.

References

Adler P.H. 2022. World blackflies (Diptera: Simuliidae): a comprehensive revision of the taxonomic and geographical inventory [2022]. Clemson University, Clemson, South Carolina, 145 pp.

Adler P.H., Currie D.C., Wood D.M., Idema R.M., & Zettler L.W. 2004. The black flies (Simuliidae) of North America. Comstock Pub. Associates, New York, 941 pp.

Crosskey R.W. 1990. The natural history of blackflies. John Wiley & Sons Ltd, 722 pp.

Glatthaar R. 1978. Verbreitung und Ökologie der Kriebelmücken (Diptera, Simuliidae) in der Schweiz. Vierteljahresschrift der Naturforschenden Gesellschaft Zürich 123: 71-124.

Glatthaar R. 1998. 14. Simuliidae. In: Merz B., Bächli G., Haenni J.-P. & Gonseth Y. (eds). Diptera - Checklist. Fauna Helvetica 1: 105-106. CSCF / SEG, Neuchâtel, 369 pp.

Jedlička L. & Stloukalová V. 1997. 2.20. Family Simuliidae. In: Papp L. & Darvas B. (eds). Contributions to a Manual of Palaearctic Diptera (with special reference to flies of economie importance). Vol. 2, Nematocera and Lower Brachycera: 331-348. Science Herald, Budapest, 592 pp.

Jedlička L., Kúdela M. & Stloukalová V. 2004. Key to the identification of blackfly pupae (Diptera: Simuliidae) of Central Europe. Biologia 59(Suppl. 15): 157-178.

Knoz, J. 1965. To identification of Czechoslovakian Black-Flies (Diptera, Simuliidae). Folia Facultatis Scientiarum Naturalium Universitatis Purkynianae Brunensis, Biologia 2, 6(5): 1-54.

Kölliker A. 1842. Observationes de prima insectorum genesi adjecta articulatorum evolutionis cum vertebratorum comparatione. Dissertation inauguralis, Meyer et Zeller, Turici [Zürich], 31 pp. + 3 pl.

Kúdela M., Kúdelová T. & Krčmárik S. 2022. Identification Key for Hydrobiologists, Part IX. Simuliidae - Larvae and Pupae. Slovenská vodohospodárska spoločnosť pri VÚVH, člen ZSVTS Výskumným ústav vodného hospodárstva; Slovenská vodohospodárska spoločnosť, člen ZSVTS Zväz slovenských vedeckotechnických spoločností. Editori: Margita Lešťáková, Zuzana Vráblová, Miroslav Mláka, Soňa Ščerbáková, Emília Mišíková Elexová. Bratislava, 74 pp.

Roskov Y., Ower G., Orrell T., Nicolson D., Bailly N., Kirk P.M., Bourgoin T., DeWalt R.E., Decock W., van Nieukerken E., Zarucchi J. & Penev L. (eds). 2019. Species 2000 & ITIS Catalogue of Life, 25 Mar 2019. www.catalogueoflife.org/col. Species 2000: Naturalis, Leiden, the Netherlands.

Rubzov I.A. & Yankovsky A.V. 1988. Simuliidae. In: Soós Á. & Papp L. (eds). Catalogue of Palaearctic Diptera. Vol. 3: 114-185. Akadémiai Kiadó, Budapest, 448 pp.

Schellenberg, J.R. & Anonymi. 1803. Genres des Mouches Diptères représentés en XLII. planches projetées et dessinées par Mr. J.R. Schellenberg, et expliquées par deux amateurs de l'Entomologie. Gattungen der Fliegen in XLII. Tafeln entworfen und gezeichnet von J.R. Schellenberg und erklärt durch zwey Liebhaber der Insektenkunde. Orell, Fuessli et Compagnie, Zurich, 95 pp. + 42 pl.