

Psychodidae

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Diagnosis: Psychodidae (moth flies or owl flies; Phlebotominae: sand flies) is a family of the lower Diptera (Nematocera) that consists of 6 extant and 1 extinct subfamilies, four of which – Phlebotominae, Sycoracinae, Trichomyiinae and Psychodinae – occur in Switzerland. Wings and body of the slightly humpbacked adults are mostly covered by hairs and setae (except Sycoracinae) that make them look like small hopping wool balls; Psychodidae are therefore unmistakably distinguished even in the field. The elongate to oval wings have nine or ten longitudinal veins and almost no cross-veins. Antenna consists of scape, pedicel and a flagellum of usually 13 flagellomeres in Phlebotominae, Trichomyiinae and Sycoracinae and 14 flagellomeres in Psychodinae, apical segments sometimes reduced in size or number. Flagellomeres with ascoids, hyaline sensory rods of very different size and shape. Mouthparts of female Phlebotominae and Sycoracinae are adapted for piercing animal skin. Male Psychodinae have several remarkable structures on head and thorax. Posterior part of head with club-shaped structures in some genera (e.g. *Clytrocerus*, *Panimerus*, *Jungiella*). Males of some genera have eversible or permanently everted structures on pro- and/or mesothorax for sexual display or to release pheromones (e.g. *Ulomyia*, *Pneumia*, *Peripsychoda*). Abdomen with 8 segments and terminalia; male genitalia usually rotated by 180° – unrotated in Sycoracinae. Larvae of Phlebotominae are terrestrial, head with 3 antennal segments, abdomen segments with ventral creeping welts, terminal segment with 4 long setae. Pseudosegmentation adumbrate. Sycoracinae larvae are aquatic, very small, similar in appearance to isopods. Trichomyiinae larvae are elongate with a sclerotised head capsule, antenna 1-segmented, body weakly sclerotised; rarely collected in tree holes and rotting wood (chestnut, elm, willow).

The amphipneustic larvae of Psychodinae are characteristic; the body is divided in usually 26 (27 in genus *Atrichobrunettia*) body rings (annuli). The thorax segments and the first abdomen segment are composed of 2 rings, and the abdomen segments 2-7 of 3 rings. The terminal segments are lumped to a «siphonal apparatus» with anus ventral and stigmata dorsal. Annuli with plates of different size and shape, tergites are largest. More or less elongate true and/or accessory setae insert on the plates. Number and position of setae are characteristic; thus larvae are often identifiable to species. Larvae and adults live in or near aquatic or at least «very moist» habitats, in springs, streams, or waterfalls with generally hygropetric or madicolous conditions. Pupae are indistinguishable.

Biology: Adults are poor flyers and usually found near larval habitats. Adults of some species are known to use pheromones to detect conspecifics (Elger 1981, Feuerborn 1922). Many Psychodinae larvae are stenotopic, and can be used to characterise habitats. Vaillant (1971) proposed a system of ecological groups for Palearctic Psychodinae. Basic requirements for larvae are sufficient moisture, solid substrate with food, and permanent access to atmospheric oxygen. Larvae (individual genera) live from mosses in clean mountain streams to garbage dumps. Some euryecious species are widely distributed in Europe or even cosmopolitans. *Clogmia albipunctata*, a species originating from the tropics, invaded parts of West- and Central Europe during the last decades. The euryecious larvae cause nuisance to man; they occur in old swimming pools,



Tinearia alternata,
male (CMPD2, p.206).

rotting moist wood, compost heaps, and there are even reports of male and female human genitalia infestation. Some *Psychoda* species are pollinators of *Arum maculatum*, attracted by the unpleasant smell (Remmert 1969, Gfrerer et al. 2022, Laina et al. 2022). Favourable environments for the occurrence of Phlebotominae sand flies are related to the presence of old barns, shelters and house basements with non-concrete ground, and of stone walls, rocks and caves, preferably sun exposed.

A life cycle comprises egg, 4 larval instars pupae and adults. Generation time is 1 year or even longer in species from high mountains or cold streams; in some euryecous species the life cycle is only 1-2 weeks under optimal conditions.

Phlebotominae bite birds, mammals and reptiles, and sometimes man; they may be vectors of disease pathogens (e.g. *Leishmania* parasite or Phleboviruses). Sycoracinae bite amphibians and can transmit microfilarial worms. *Phlebotomus (Larrousius) perniciosus* Newstead and *Phlebotomus (Larrousius) neglectus* Tonnoir are considered as important vectors of *Leishmania* parasites to dogs and occasionally to humans. The second species is spreading eastwards and northward in Europe and was recently detected in Switzerland (Ticino). *Psychoda (Tinearia) alternata* Say and *Clogmia albipunctata* (Williston) are two species of medical importance. Larvae of both may infest humans by dirty wounds or insufficient cleanliness; recently *C. albipunctata* was detected in hospital wastewater systems (Rupprecht et al. 2022). Thereby they may transfer diseases (myiasis and others). Decaying bodies of adults are known to cause illnesses similar to bronchial asthma.

Nomenclature and classification: According to Vaillant (1971-1982) with a number of nomenclatorial changes (Ježek 1983, 1984, 1985, Kvifte 2014) and more.

Number of species: CH: 79 (1998 Checklist: 61),
DE: ~120, FR: ~150, IT: ~90, Europe: ~300, World: ~2500.

Level of faunistic knowledge in Switzerland: Complete and up-to-date for Phlebotominae, in need of improvement for Psychodinae.

General references: Vaillant (1971-1982, 1990) [Palearctic fauna with ecological information], Desportes (1942), Szabó (1970), Krek (1999).

References to the Swiss fauna: Wagner (1998), Schaffner et al. (2023), Knechtli & Jenni (1989), Grimm et al. (1993).

Checklist

- Bazarella* Vaillant, 1961
 - *subneglecta* (Tonnoir, 1922) L
- Berdeniella* Vaillant, 1976
 - *freyi* (Berdén, 1954) !
 - *glacialis* (Vaillant, 1958) !
 - *helvetica* (Sarà, 1957) !
 - *magniseta* (Sarà, 1953) !
 - *manicata* (Tonnoir, 1919) L
 - *nivalis* Vaillant, 1976 L
 - *unispinosa* (Tonnoir, 1919) !
- Clogmia* Enderlein, 1937
 - *albipunctatus* (Williston, 1893) !
- Clytocyercus* Eaton, 1904
 (*Boreoclytocyercus* Duckhouse, 1978)
 - *dalii* (Eaton, 1893) !
 - *ocellaris* (Meigen, 1804) !
- Feuerborniella* Vaillant, 1974
 - *obscura* (Tonnoir, 1919) !
- Jungiella* Vaillant, 1972
 (*Jungiella* s.str.)
 - *soleata* (Walker, 1856) L
- Mormia* Enderlein, 1935
 (*Hemimormia* Hemimormia Krek, 1971)
 - *eatoni* (Tonnoir, 1940) !
 (*Limomormia* Vaillant, 1983)
 - *helvetica* Vaillant, 1974 !
 (*Mormia* s.str.)
 - *nigripennis* Krek, 1971 !
 - *revisenda* (Eaton, 1893) !
 (*Perimormia* Vaillant, 1974)
 - *albicornis* (Tonnoir, 1919) !
- Panimerus* Eaton, 1913
 - *albifacies* (Tonnoir, 1919) L

- *maynei* (Tonnoir, 1920) !
- Paramormia* Enderlein, 1935
 - *ustulata* (Walker, 1856) L
- Pericoma* Haliday in Walker, 1856
(*Pachypericoma* Vaillant, 1978)
 - *blandula* Eaton, 1893 !
- (*Pericoma* s.str.)
 - *alticola* Vaillant, 1955 !
 - *exquisita* Eaton, 1893 !
 - *pannonica* Szabó, 1960 L
 - *pseudoexquisita* Tonnoir, 1940 !
 - *trifasciata* (Meigen, 1804) L
- Peripsychoda* Enderlein, 1935
 - *auriculata* (Curtis, 1839) !
- Philosepedon* Eaton, 1904
 - *humeralis* (Meigen, 1818) ?
- Phlebotomus* Rondani & Berté, 1840
(*Larroussius* Nitzulescu, 1931)
 - *neglectus* Tonnoir, 1921 !
 - *perniciosus* Newstead, 1911 !
- (*Transphlebotomus* Artemiev, 1984)
 - *mascittii* Grassi, 1908 !
- Phyllotelmatoscopus* Vaillant, 1982
 - *longipennis* (Krek, 1972) !
- Pneumia* Enderlein, 1935
 - *canescens* (Meigen, 1804) !
 - *cubitospinosa* (Jung, 1953) !
 - *delphiniensis* (Georges, 1964) !
 - *nubila* (Meigen, 1818) L
 - *palustris* (Meigen, 1818) !
 - *pilularia* (Tonnoir, 1940) L
 - *trivialis* (Eaton, 1893) !
- Psychoda* Latreille, 1797
 - *albipennis* Zetterstedt, 1850 !
 - *brevicornis* Tonnoir, 1940 !
 - *buxtoni* Withers, 1988 !
 - *cinerea* Banks, 1894 !
 - *crassipennis* Tonnoir, 1940 !
 - *erminea* Eaton, 1898 !
 - *gemina* (Eaton, 1904) !
 - *grisescens* Tonnoir, 1922 !
 - *lobata* Tonnoir, 1940 !
 - *minuta* Banks, 1894 !
 - *mycophila* Vaillant, 1988 !
 - *parthenogenetica* Tonnoir, 1940 !
 - *phalaenoides* (Linnaeus, 1758) !

- *setigera* Tonnoir, 1922 !
- *surcoufi* Tonnoir, 1922 ?
- *trinodulosa* Tonnoir, 1922 !
- Saraiella* Vaillant, 1973
 - *auberti* (Sarà, 1954) L
 - *crypta* (Vaillant, 1955) L
 - *onerata* (Vaillant, 1957) !
- Seoda* Enderlein, 1935 N1
 - *britteni* Tonnoir, 1940 L
 - *morula* (Eaton, 1893) !
- Sergentomyia* Franca & Parrot, 1920
(*Sergentomyia* s.str.)
 - *minuta* (Rondani, 1843) !
- Sycorax* Haliday, 1839
 - *feuerborni* Jung, 1954 !
 - *silacea* Haliday in Curtis, 1839 !
 - *similis* (Müller, 1927) !
 - *tonnoiri* Jung, 1954 !
- Telmatoscopus* Eaton, 1904 N1
 - *advena* (Eaton, 1893) !
- Threticus* Eaton, 1904
 - *balkaneoalpinus* Krek, 1971 !
 - *incurvus* Krek, 1972 L
 - *lucifugus* (Walker, 1856) ?
- Tinearia* Schellenberg, 1803
 - *alternata* (Say, 1824) !
 - *lativentris* (Berdén, 1952) !
- Tonnoiriella* Vaillant, 1971
 - *nigricauda* (Tonnoir, 1919) !
 - *pulchra* (Eaton, 1893) !
- Trichomyia* Haliday, 1839
 - *urbica* Haliday in Curtis, 1839 !
- Trichopsychoda* Tonnoir, 1922
 - *hirtella* (Tonnoir, 1919) !
- Ulomyia* Walker, 1856
 - *fuliginosa* (Meigen, 1804) !
 - *hispanica* (Sarà, 1954) ? N2
 (*Periulomyia* Krek, 1999)
 - *cognata* (Eaton, 1893) !

Notes

N1 Kvitte (2014) revised genera *Telmatoscopus* and *Seoda*.

N2 *Ulomyia undulata* (Tonnoir, 1919) might have been a misidentification. New material is needed to confirm its presence in Switzerland.

References

- Desportes C. 1942. *Forcipomyia velox* et *Sycorax silacea* vecteurs d'*Icosella neglecta*, filaire commune de la grenouille verte. Annales de Parasitologie humaine et comparée 19: 53-68.
- Elger M. 1981. The ultrastructure of special epidermal organs in Psychodidae (Diptera). I. Appendages on mesothorax of male *Ulomyia fuliginosa* (Meigen). Acta Zoologica Stockholm 62: 1-16.
- Feuerborn H.J. 1922. Der sexuelle Reizapparat (Schmuck-, Duft- und Berührungsorgane) der Psychodiden nach biologischen und physiologischen Gesichtspunkten untersucht. Archiv für Naturgeschichte. 88, A 4: 1-137.
- Gfrerer E., Laina D., Wagner R., Gibernau M., Hörger A.C., Comes H.P. & Dötterl S. 2022. Antennae of psychodid and sphaerocerid flies respond to a high variety of floral scent compounds of deceptive *Arum maculatum* L. Scientific Reports 12: 5086.
- Grimm F., Gessler M. & Jenni L. 1993. Aspects of sandfly biology in southern Switzerland. Medical and Veterinary Entomology 7: 170-176.
- Ježek J. 1983. Contribution to the knowledge of Mormiini End. (Diptera, Psychodidae) in Czechoslovakia. Acta Entomologica Musei Nationalis Pragae, Series B, Historia Naturalis 41: 235-253.
- Ježek, J. 1984. Six new genera of the tribe Psychodini End. (Diptera, Psychodidae). Acta Faunistica Entomologica Musei Nationalis Pragae 17: 133-154.
- Ježek J. 1985. Contribution to the knowledge of a new subtribe Trichopsychodina (Diptera, Psychodidae) from Czechoslovakia. Acta Musei Nationalis Pragae, series B, Historia Naturalis 40(1984): 1-19.
- Knechtli R. & Jenni L. 1989. Distribution and relative density of three sandfly (Diptera: Phlebotominae) species in southern Switzerland. Annales de Parasitologie Humaine et Comparée 64: 53-63.
- Krek S. 1999. Psychodidae (Diptera, Insecta) Balkanskog Poluotoka. Federacija Bosne i Hercegovine. Studentska tamparija Univerziteta Sarajevo, 417 pp.
- Kvifte G.M. 2014. Nomenclature and taxonomy of *Telmatoscopus* Eaton and *Seoda* Enderlein; with a discussion of parameral evolution in Paramormiini and Pericomaini (Diptera: Psychodidae, Psychodinae). Zootaxa 3878(4): 390-400.
- Laina D, Gfrerer E, Scheurecker V, Fuchs R, Schleifer M, Zित्रa C, Wagner R, Gibernau M, Comes H.P., Hörger A.C. & Dötterl S. 2022. Local insect availability partly explains geographical differences in floral visitor assemblages of *Arum maculatum* L. (Araceae). Frontiers in Plant Science 13: 838391.
- Remmert H. 1969. Tageszeitliche Verzahnung der Aktivität verschiedener Organismen. Oecologia 3: 214-226
- Rupprecht T., Moter A., Wiessener A., Reutershan J., Lang-Schwarz K., Vieth M., Rupprecht C., Wagner R. & Bollinger T. 2022. Spread of multidrug-resistant Bacteria by moth flies from hospital waste water system. Emerging Infectious Diseases 26(8): 1893-1898 + 8 pp.
- Schaffner F., Silaghi C., Verhulst N.O., Depaquit J. & Mathis A. 2023. The Phlebotomine sand fly fauna of Switzerland revisited. Medical and Veterinary Entomology 38: 13-22.
- Szabó J. 1970. Über die Ernährungsbiologie der Psychodiden-Larven (Dipt. Nematocera). Acta Biologica Debrecina 7-8: 169-175. [In Hungarian with German summary].
- Vaillant F. 1971-1982. Psychodidae - Psychodinae. In: Lindner E. (ed). Die Fliegen der Palaearktischen Region. Lief. 287, 291, 292, 305, 310, 313, 317, 320, 326, 328. Schweizerbart, Stuttgart, 358 pp. + 120 pl.
- Vaillant F. 1990. Propositions pour une révision de la classification des Diptères Psychodidae Psychodinae. Bulletin de la Société Vaudoise des Sciences Naturelles 80: 141-163.
- Wagner R. 1998. 8. Psychodidae. In: Merz B., Baechli G., Haenni J.-P. & Gonseth Y. (eds). Diptera - Checklist. Fauna Helvetica 1: 84-86. CSCF / SEG, Neuchâtel, 369 pp.