

Sarcophagidae

Daniel Whitmore & Thomas Pape (1998 Checklist: Thomas Pape & Bernhard Merz)

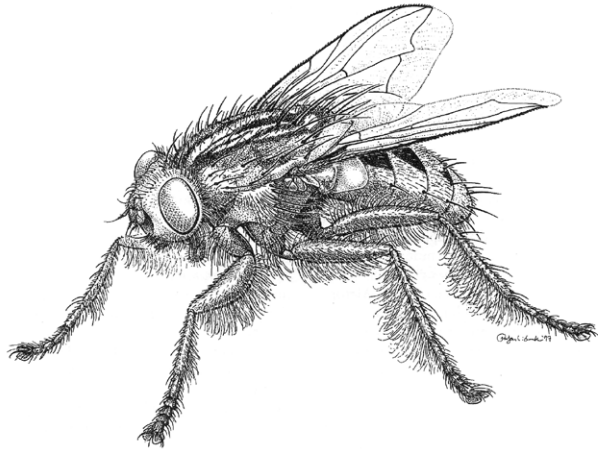
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Diagnosis: Small to large (3.0-20.0 mm), robust brachyceran flies varying from a sand-coloured, mottled appearance (common in the subfamily Miltogramminae) to combinations of grey and black colouration, with a typical striped thorax/chequered abdomen pattern in the subfamily Sarcophaginae. Eyes bare, often of a reddish brick colour. Frons usually narrower in males, but eyes never touching. Proclinate frontal setae absent in males of most species (all species of Sarcophaginae). Antennal arista well developed, bare in Miltogramminae, with long hairs (not reaching tip of arista) in all Sarcophaginae and most Paramacronychiinae. Proboscis short to medium-length, never very long. Terminal section of wing vein M always bent towards vein R_{4+5} , usually at a sharp angle of around 90°; wing cell r_{4+5} usually open or closed at wing margin, rarely short-petiolate. Mid femur with a ctenidium in male *Blaesoxipha* and *Ravinia*. Posterior surface of female mid femur (in a few species also fore femur) of several species of *Sarcophaga* with a weakly-sclerotised, sometimes discoloured area (mid femoral organ). Male genitalia strongly modified in Paramacronychiinae and Sarcophaginae, with numerous species-specific diagnostic characters in the distiphallus. Tergite 6 fused to syntergosternite 7+8 in Sarcophaginae. Epandrium enlarged (bulging) and shiny in the genus *Sarcophaga*. Female genitalia usually short, unmodified; with a piercer in the genus *Blaesoxipha*. Larvae (and puparium) with posterior spiracles situated within a recession.

Biology: Adult sarcophagids (common name: «flesh flies») are most active from late March to October. They visit flowers, carrion, faeces and other decomposing matter. Males of most species are most active in full sunlight, often occupying small territories on the ground or on low vegetation such as stones, patches of leaf litter or broad leaves; males of several species aggregate on hilltops or other elevated landscape features. Females are not territorial and are often seen on flowers or actively searching for a suitable larval substrate on the ground or in low vegetation. Females of all Sarcophagidae are viviparous or ovoviviparous, laying live first instar larvae or fully incubated eggs that are ready to hatch. Males and females of many Miltogramminae occur in sandy habitats, close to their hymenopteran hosts. The larvae of most members of this subfamily are kleptoparasitic in nests of solitary bees and wasps, feeding on prey or pollen stocked by the host for its offspring. The larval biology of other flesh flies is diverse, ranging from necrophagy on large and small carrion and coprophagy to parasitoidism or predation on (e.g.) snails, grasshoppers (*Blaesoxipha*), earthworms, moth pupae, bumblebees, spider egg sacs and lizard eggs. Larvae of *Wohlfahrtia* (and occasionally some *Sarcophaga* species) are parasites of vertebrates (= agents of myiasis), including farmed and domestic animals and (rarely) humans.

Nomenclature and classification: According to Fauna Europaea (Pape 2004), with some minor changes (see notes).

Number of species: CH: 125 (1998 Checklist: 119),
BE: 64, CZ: 129, DE: 130, FR: 174, GB: 65, HR: 148, HU: 140, IT: 200, NL: 74, SK: 128, Europe: ~310,



Wohlfahrtia bella,
male, not present in Switzerland
(CMPD3, p. 650).

World: ~3100.

(BE, CZ, DE, FR, HU, NL, SK, Europe: Pape 2004, GB: Whitmore et al. 2020, HR: Krčmar et al. 2019, World: Courtney et al. 2017, IT: Pape 2004, Whitmore et al. unpublished)

Level of faunistic knowledge in Switzerland: Good.

General references: Pape (1987) [fauna of Denmark and Fennoscandia], Pape (1996) [world catalogue], Pape (1998) [Palaeartic manual], Pape (2004) [Fauna Europaea], Povolný & Verves (1997) [Central European fauna], Richet et al. (2011) [French fauna (*Sarcophaga*)], Rohdendorf (1930, 1935, 1971, 1975, 1982) [Palaeartic fauna], Rohdendorf (1937) [fauna of the USSR], Szpila (2010) [Miltogramminae first instar larvae], Verves (1982, 1985) [Palaeartic fauna], Verves (1986) [Palaeartic catalogue], Whitmore et al. (2020) [key to British species].

References to the Swiss fauna: Cherix et al. (2012), Faucherre & Cherix (1998), Kuhlmann (1995), Merz et al. (2002), Pape (2004), Pape & Merz (1998), Whitmore (2011), Whitmore et al. (2013).

Checklist

- Agria* Robineau-Desvoidy, 1830
- *affinis* (Fallén, 1817) L
 - *mamillata* (Pandellé, 1896) L N1
 - *monachae* (Kramer, 1908) L N2
- Amobia* Robineau-Desvoidy, 1830

- *pelopei* (Rondani, 1859) !
- *signata* (Meigen, 1824) !
- Angiometopa* Brauer & Bergenstamm, 1889
 - *falleni* Pape, 1986 L
 - *flavisquama* Villeneuve, 1911 !
- Blaesoxipha* Loew, 1861
 - (*Acridiophaga* Townsend, 1917)
 - *fossoria* (Pandellé, 1896) ! [1]
 - (*Blaesoxipha* s.str.)
 - *arenicola* Rohdendorf, 1928 !
 - *cochlearis* (Pandellé, 1896) ! N3
 - *colorata* Verves, 1985 ! N4
 - *lapidosa* Pape, 1994 !
 - = *campestris* auct. nec Robineau-Desvoidy, 1863
 - *laticornis* (Meigen, 1826) !
 - = *grylloctona* Loew, 1861
 - *lautaretensis* Villeneuve, 1928 L
 - *litoralis* (Villeneuve, 1911) !
 - *matilei* Léonide & Léonide, 1983 ! [2]
 - = *descosseae* Léonide & Léonide, 1983
 - *occatrix* (Pandellé, 1896) !
 - *plumicornis* (Zetterstedt, 1859) !
 - *pygmaea* (Zetterstedt, 1844) L
 - *redempta* (Pandellé, 1896) !
 - *ungulata* (Pandellé, 1896) ! N5 [3]
 - *unicolor* (Villeneuve, 1912) !
 - (*Servaisia* Robineau-Desvoidy, 1863)
 - *erythrura* (Meigen, 1826) !
 - *rossica* Villeneuve, 1912 !
 - (*Tephromyia* Brauer & Bergenstamm, 1891)
 - *grisea* (Meigen, 1826) !
- Brachicoma* Rondani, 1856
 - *devia* (Fallén, 1820) !
- Macronychia* Rondani, 1859
 - *agrestis* (Fallén, 1810) !
 - *alpestris* Rondani, 1865 !
 - *dolini* Verves & Khrokalo, 2006 ! N6
 - *griseola* (Fallén, 1820) !
 - *polyodon* (Meigen, 1824) ! [4]
 - *striginervis* (Zetterstedt, 1838) !
- Metopia* Meigen, 1803
 - *argentata* Macquart, 1850 !
 - = *stackelbergi* Rohdendorf, 1955
 - *argyrocephala* (Meigen, 1824) ! [5]
 - *campestris* (Fallén, 1810) ! [6]
 - *grandii* Venturi, 1953 ! [7]

- *italiana* Pape, 1985 !
 - = *argentata* auct. nec Macquart, 1850
- *staegerii* Rondani, 1859 !
- *tshernovae* Rohdendorf, 1955 !
- Miltogramma* Meigen, 1803
 - *brevipila* Villeneuve, 1911 !
 - *germari* Meigen, 1824 !
 - *occipitalis* Pandellé, 1895 ! N7 [8]
 - *punctata* Meigen, 1824 !
 - *taeniata* Meigen, 1824 !
 - *testaceifrons* (von Roser, 1840) !
 - *villeneuvei* Verves, 1982 !
- Nyctia* Robineau-Desvoidy, 1830
 - *halterata* (Panzer, 1798) ! [9]
- Oebalia* Robineau-Desvoidy, 1863
 - *cylindrica* (Fallén, 1810) ! [10]
 - *minuta* (Fallén, 1810) ! [11]
- Paramacronychia* Brauer & Bergenstamm, 1889
 - *flavipalpis* (Girschner, 1881) ! [12]
- Phrosinella* Robineau-Desvoidy, 1863
 - *nasuta* (Meigen, 1824) !
- Phylloteles* Loew, 1844
 - *pictipennis* Loew, 1844 !
- Pterella* Robineau-Desvoidy, 1863
 - *grisea* (Meigen, 1824) ! [13]
 - *melanura* (Meigen, 1824) !
- Ravinia* Robineau-Desvoidy, 1863
 - *pernix* (Harris, 1780) !
- Sarcophaga* Meigen, 1826
 - (*Bellieriomima* Rohdendorf, 1937)
 - *subulata* Pandellé, 1896 ! [14]
 - (*Bercaea* Robineau-Desvoidy, 1863)
 - *africa* (Wiedemann, 1824) !
 - = *cruentata* Meigen, 1826
 - (*Helicophagella* Enderlein, 1928)
 - *agnata* Rondani, 1860 !
 - *crassimargo* Pandellé, 1896 !
 - *hirticrus* Pandellé, 1896 !
 - *melanura* Meigen, 1826 !
 - *noverca* Rondani, 1860 !
 - *novercoides* Böttcher, 1913 L
 - *okaliana* (Lehrer, 1975) !
 - *rosellei* Böttcher, 1912 !
 - (*Heteronychia* Brauer & Bergenstamm, 1889)
 - *amita* Rondani, 1860 ! N8 [15]
 - *ancilla* Rondani, 1865 ! N9 [16]

- *arcipes* Pandellé, 1896 ! N8 [17]
- *bulgarica* (Enderlein, 1936) !
 - = *boettcheriana* Rohdendorf, 1937
- *cucullans* Pandellé, 1896 ! N8
- *depressifrons* Zetterstedt, 1845 ! [18]
- *dissimilis* Meigen, 1826 ! [19]
- *filia* Rondani, 1860 ! [20]
- *haemorrhoea* Meigen, 1826 !
- *haemorrhoides* Böttcher, 1913 L
- *infantilis* Böttcher, 1913 ! N10
- *lederbergi* (Lehrer, 1995) ! N11
 - = *borodorf* Pape, 1996
 - = *rohdendorfi* Povolný & Slamecková, 1959
- *nigricaudata* (Povolný & Slamecková, 1982) ! N12
- *pauciseta* Pandellé, 1896 !
- *proxima* Rondani, 1860 ! [21]
- *pumila* Meigen, 1826 ! N8 [22]
- *rondaniana* (Rohdendorf, 1937) !
- *schineri* Bezzi, 1891 ! [23]
- *vagans* Meigen, 1826 ! [24]
- *vicina* Macquart, 1835 ! [25]
- (*Kramerea* Rohdendorf, 1937)
 - *schuetzei* Kramer, 1909 !
- (*Krameromyia* Verves, 1982)
 - *anaces* Walker, 1849 !
- (*Liopygia* Enderlein, 1928)
 - *argyrostoma* (Robineau-Desvoidy, 1830) ! [26]
- (*Liosarcophaga* Enderlein, 1928)
 - *emdeni* (Rohdendorf, 1969) !
 - *pleskei* (Rohdendorf, 1937) !
 - *portschinskyi* (Rohdendorf, 1937) !
 - *teretirostris* Pandellé, 1896 !
 - *tuberosa* Pandellé, 1896 L
- (*Mehria* Enderlein, 1928)
 - *nemoralis* Kramer, 1908 !
 - *sexpunctata* (Fabricius, 1805) !
 - = *clathrata* Meigen, 1826
- (*Myorhina* Robineau-Desvoidy, 1830)
 - *lunigera* Böttcher, 1914 !
 - *nigriventris* Meigen, 1826 !
 - *pandifera* Blackith & Pape, 1999 !
 - = *discifera* auct. nec Pandellé, 1896 N13
 - *socrus* Rondani, 1860 !
 - *soror* Rondani, 1860 !
 - = *discifera* Pandellé, 1896 N14
- (*Pandelleana* Rohdendorf, 1937)

- *protuberans* Pandellé, 1896 !
- (*Pandelleisca* Rohdendorf, 1937)
- *similis* Meade, 1876 !
- (*Parasarcophaga* Johnston & Tiegs, 1921)
- *albiceps* Meigen, 1826 !
- (*Robineauella* Enderlein, 1928)
- *caerulescens* Zetterstedt, 1838 ! [27]
- (*Rosellea* Rohdendorf, 1937)
- *aratrix* Pandellé, 1896 !
- (*Sarcophaga* s.str.)
- *carnaria* (Linnaeus, 1758) !
- *jeanleclercqi* Lehrer, 1975 !
- *lehmanni* Müller, 1922 !
- *subvicina* Rohdendorf, 1937 !
- *variegata* (Scopoli, 1763) !
- (*Sarcotachinella* Rohdendorf, 1937)
- *sinuata* Meigen, 1826 !
- (*Thyrsocnema* Enderlein, 1928)
- *incisilobata* Pandellé, 1896 !
- *kentejana* (Rohdendorf, 1937) !
- Sarcophila* Rondani, 1856
- *latifrons* (Fallén, 1817) !
- Senotainia* Macquart, 1846
- *albifrons* (Rondani, 1859) ! [28]
- *conica* (Fallén, 1810) ! [29]
- *puncticornis* (Zetterstedt, 1838) !
- *tricuspis* (Meigen, 1838) !
- Sphenometopa* Townsend, 1908
- *eluta* (Pandellé, 1895) !
- *fastuosa* (Meigen, 1824) ! [30]
- *stelviana* (Brauer & Bergenstamm, 1891) ! [31]
- Taxigramma* Perris, 1852
- *heteroneura* (Meigen, 1830) ! [32]
- *hilarella* (Zetterstedt, 1844) !
- *stictica* (Meigen, 1830) !
- Wohlfahrtia* Brauer & Bergenstamm, 1889
- *meigenii* (Schiner, 1862) L N15

Excluded species

- Blaesoxipha batilligera* Séguy, 1941 N3
- Macronychia kanoi* Kurahashi, 1972 N6
- Sarcophaga bezziana* Böttcher, 1913 N10
- Sarcophaga dux* Thomson, 1869 ! N16
- Wohlfahrtia vigil* (Walker, 1849) N15

Notes

- N1 *Agria mamillata*: Added by Pape (2004) based on Kuhlmann (1995).
- N2 *Agria monachae*: Added by Pape (2004) (source of record unknown).
- N3 *Blaesoxipha cochlearis*: Previously misidentified as *B. batilligera*. Here correctly identified following Verves (1985) and our recent examination of the lectotype of *B. cochlearis* in Staatliches Museum für Naturkunde Stuttgart (unpublished).
- N4 *Blaesoxipha colorata*: Previously misidentified as *B. cochlearis*. Here correctly identified following Verves (1985) and based on our examination of the primary types of *B. cochlearis* and *B. colorata* (Staatliches Museum für Naturkunde Stuttgart).
- N5 *Blaesoxipha ungulata*, previously listed only from the literature, is confirmed based on a female from Valais (G. Bächli collection).
- N6 *Macronychia dolini*: Previously misidentified as *Macronychia kanoi* (see Verves & Khrokalo 2006).
- N7 *Miltogramma occipitalis*: Added based on specimens from Valais (Staatliches Museum für Naturkunde Stuttgart).
- N8 *Heteronychia amita*, *H. arcipes*, *H. cucullans*, *H. pumila*: Previously listed in the subgenus *Discachaeta*, which is now a junior synonym of the subgenus *Heteronychia* (see Whitmore et al. 2013).
- N9 *Sarcophaga ancilla*: Added based on specimens from Valais (Naturhistoriska riksmuseet, Stockholm).
- N10 *Sarcophaga infantilis*: Previously misidentified as *Sarcophaga bezziana* (see Whitmore et al. 2009).
- N11 *Sarcophaga lederbergi* is the correct name for *S. borodorf* (see Pape 2004).
- N12 *Sarcophaga nigricaudata*: This species is here considered valid based on morphology and removed from synonymy with *S. dissimilis*, **stat. res.**
- N13 *Sarcophaga pandifera/discifera* auct.: Misidentification resolved by Blackith & Pape (1999).
- N14 *Sarcophaga soror*: Senior synonym of *S. discifera* (see Blackith & Pape 1999).
- N15 *Wohlfahrtia meigenii*: Previously misidentified as *W. vigil* (see Krčmar et al. 2019).
- N16 *Sarcophaga dux* was recorded by Cherix et al. (2012) based on a female specimen from Vaud in Musée cantonal de zoologie (Naturéum), Lausanne. The specimen was examined and re-identified by us as *Sarcophaga (Sarcophaga) sp.*, and *S. dux* is accordingly removed from the Swiss list.

Species records

- [1] 1M 1F, GR, Dischmatal, 16.6.1990, leg. Peter Brodmann (CGB)
- [2] 1F, SH, Merishausen, 19.8.1992, leg. Gerhard Bächli (CGB)
- [3] 1F, VS, Mörel, 28.5.2010, 850 m., leg. Martin Obrist (CGB)
- [4] 1M, TI, Gordola, 12.6.1969, leg. Benno Herting (SMNS)
- [5] 1M, TI, Bignasco, 18.9.1983, leg. Hans-Peter Tschorsnig (SMNS)
- [6] 1M, ZH, Zürich, Pfannenstiel, 31.5.1954, leg. Benno Herting (SMNS)
- [7] 1M, SO, Messen, KF 83, 28.6.2004, leg. Beat Wermelinger (CGB)
- [8] 1F, VD, Val de Triqueut, 10.7.1929, leg. Erwin Lindner (SMNS)
- [9] 1M, SO, Messen, KF 83, 19.7.2004, leg. Beat Wermelinger (CGB)
- [10] 1M, JU, Delémont, Domont, 7.7.1964, leg. Benno Herting (SMNS)
- [11] 1M, JU, Delémont, Domont, 30.6.1964, leg. Benno Herting (SMNS)
- [12] 1M, GR, Celerina, 2005, leg. Peter Duelli (CGB)
- [13] 1F, VS, Leuk-Platten, 1.8.1998, leg. Bernhard Merz (CGB)
- [14] 1M, SO, Messen, KF 71, 9.8.2004, leg. Beat Wermelinger (CGB)
- [15] 9M, VS, Leuk-Platten, 1.8.1998, leg. Bernhard Merz (CGB)
- [16] 1M, VS, Leuk-Pfywald, 25.5.1997, 630 m., leg. Bernhard Merz (MHND)
- [17] 1M, VS, Leuk-Brentjüng, 25.6.1999, leg. Gerhard Bächli (CGB)
- [18] 2M, ZH, Zürich-Zürichberg, 22.7.1996, 650 m., leg. Bernhard Merz (MHND)
- [19] 1M, GL, Klöntal, Vorauen, 8.8.1995, leg. Bernhard Merz (NHMD)
- [20] 1M, VS, Jeizinen, 10.8.2013, leg. Gerhard Bächli (CGB)
- [21] 1M, VS, Leuk-Rotafen, 16.5.1996, 900 m., leg. Bernhard Merz (NHMD)
- [22] 1M, GR, Graubünden, Lenzerheide, 21.7.2000, 2000 m., leg. Bernhard Merz (NHMD)
- [23] 1M, GR, Graubünden, Savognin, 17.8.1988, leg. Gerhard Bächli (NHMD)
- [24] 1M, GL, Glarus, Klöntal, Vorauen, 8.8.1995, leg. Bernhard Merz (NHMD)

- [25] 1M, GR, Arosa, 28.6.1955, 1800 m., leg. Oscar Ringdahl (NHMD)
 [26] 1M, SO, Messen, KF 73, 5.7.2004, leg. Beat Wermelinger (CGB)
 [27] 1M, SO, Messen, KF 72, 9.8.2004, leg. Beat Wermelinger (CGB)
 [28] 1F, VS, Visp, 2005, leg. Peter Duelli (CGB)
 [29] 1F, VD, Cudrefin, 2000, leg. Peter Duelli (CGB)
 [30] 1I, Gordola, 19.6.1965, leg. Benno Herting (SMNS)
 [31] 1F, TI, Robiei, 4.7.2008, leg. Gerhard Bächli (CGB)
 [32] 1F, VS, Wallis, Pfywald, 4.8.1968, leg. Benno Herting (SMNS)

References

- Blackith R.M. & Pape T. 1999. Redescription of *Sarcophaga discifera* of authors, not Pandellé, and a new species of *Sarcophaga* Meigen from Oman (Diptera: Sarcophagidae). *Studia dipterologica* 6: 239-250.
- Blackith R.M., Richet R. & Pape T. 2004. Revision of *Sarcophaga dissimilis* Meigen, 1826 and *Sarcophaga chaetoneura* Brauer & Bergenstamm, 1889 (Diptera: Sarcophagidae). *Zootaxa* 560: 1-13.
- Cherix D., Wyss C. & Pape T. 2012. Occurrences of flesh flies (Diptera: Sarcophagidae) on human cadavers in Switzerland, and their importance as forensic indicators. *Forensic Science International* 220: 158-163.
- Courtney G.W., Pape T., Skevington J.H. & Sinclair B.J. 2017. Biodiversity of Diptera. In: Foottit, R.G. & Adler, P.H. (eds.), *Insect Biodiversity: Science and Society*. Vol. 1, 2nd Edition: 229-278. Wiley-Blackwell, Chichester.
- Faucherre J. & Cherix D. 1998. A contribution to the knowledge of necrophagous flies of the Jorat (Vaud, Switzerland). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 71(1-2): 211-217.
- Krčmar S., Whitmore D., Pape T. & Buenaventura E. 2019. Checklist of the Sarcophagidae (Diptera) of Croatia, with new records from Croatia and other Mediterranean countries. *ZooKeys* 831: 95-155.
- Kuhlmann U. 1995. Biology and predation rate of the sarcophagid fly, *Agria mamillata*, a predator of European small ermine moths. *International Journal of Pest Management* 41: 67-73.
- Merz B., Bächli G. & Haenni J.-P. 2002. Erster Nachtrag zur Checkliste der Diptera der Schweiz. *Mitteilungen der Entomologischen Gesellschaft Basel* 51(3-4)(2001): 110-140.
- Pape T. 1987. The Sarcophagidae (Diptera) of Fennoscandia and Denmark. *Fauna entomologica scandinavica* 19. E.J. Brill/Scandinavian Science Press Ltd., Leiden, Copenhagen, 203 pp. + 2 pls.
- Pape T. 1996. Catalogue of the Sarcophagidae of the world (Insecta: Diptera). *Memoirs on Entomology, International* 8: 1-558.
- Pape T. 1998. Family Sarcophagidae. In: Papp L. & Darvas B. (eds). *Contributions to a Manual of Palaearctic Diptera*. (with special reference to flies of economic importance). Vol. 3, Higher Brachycera: 649-678. Science Herald, Budapest, 880 pp.
- Pape T. 2004. Fauna Europaea: Sarcophagidae. In: Pape T. & Beuk P. (eds). *Fauna Europaea: Diptera Brachycera*. Fauna Europaea version 1.1. <http://www.faunaeur.org/>.
- Pape T. & Merz B. 1998. Sarcophagidae. In: Merz B., Bächli G., Haenni J.-P. & Gonseth Y. (eds). *Diptera - Checklist*. Fauna Helvetica 1: 338-341. CSCF / SEG, Neuchâtel, 369 pp.
- Povolný D. & Verves Y. 1997. The flesh-flies of Central Europe (Insecta, Diptera, Sarcophagidae). *Spixiana Supplement* 24: 1-262.
- Richet R., Blackith R.M. and Pape T. 2011. *Sarcophaga* of France (Diptera: Sarcophagidae): 5-327. Pensoft Publishers, Sofia.
- Rohdendorf B.B. 1930. 64h. Sarcophaginae. In: Lindner E. (ed). *Die Fliegen der palaearktischen Region*. Vol. 11, Lief. 39: 1-48. E. Schweizerbart, Stuttgart.
- Rohdendorf B.B. 1935. 64h. Sarcophaginae. In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*. Vol. 11, Lief. 88: 49-129 + 1 pl. E. Schweizerbart, Stuttgart.
- Rohdendorf B.B. 1937. Fam. Sarcophagidae. (P. 1). *Fauna USSR*, 19, xv + 1-501 pp. + [1]. Édition de l'Académie des Sciences de l'URSS, Moscow, Leningrad. [In Russian with German summary.]
- Rohdendorf B.B. 1971. 64h. Sarcophaginae. In: Lindner E. (ed). *Die Fliegen der palaearktischen Region*. Vol. 11, Lief. 285: 129-176. Schweizerbart, Stuttgart.
- Rohdendorf B.B. 1975. 64h. Sarcophaginae. In: Lindner E. (ed). *Die Fliegen der palaearktischen Region*. Vol. 11, Lief. 311: 177-232. Schweizerbart, Stuttgart.
- Rohdendorf B.B. 1982. 64h. Sarcophaginae. In: Lindner E. (ed). *Die Fliegen der palaearktischen Region*. Vol. 11, Lief. 327: 233-235. Schweizerbart, Stuttgart.

- Szpila K. 2010. The first instar of European Miltogramminae (Diptera: Sarcophagidae). Post-doctoral thesis, Nicolaus Copernicus University. Nicolaus Copernicus University Press, Toruń, 272 pp.
- Verves Yu. G. 1982. 64h. Sarcophaginae. In: Lindner E. (ed). Die Fliegen der palaearktischen Region. Vol. 11, Lief. 327: 235-296. Schweizerbart, Stuttgart.
- Verves Yu. G. 1985. 64h. Sarcophaginae. In: Lindner E. (ed). Die Fliegen der palaearktischen Region. Vol. 11, Lief. 330: 297-440. Schweizerbart, Stuttgart.
- Verves Yu. G. 1986. Family Sarcophagidae. In: Soós Á. & Papp L. (eds). Catalogue of Palaearctic Diptera. Vol. 12, Calliphoridae – Sarcophagidae: 58-193. Akadémiai Kiadó, Budapest.
- Verves Yu. G & Khrokalo L.A. 2006. Review of Macronychiinae (Diptera, Sarcophagidae) of the World. Vestnik Zoologii 40(3): 219-239.
- Whitmore D. 2011. New taxonomic and nomenclatural data on *Sarcophaga* (*Heteronychia*) (Diptera: Sarcophagidae), with description of six new species. Zootaxa 2778: 1-57.
- Whitmore D., Dupont S. & Falk S. 2020. Key to adult flesh flies (Diptera: Sarcophagidae) of the British Isles. Version 2 [9 July 2020]. OSF Preprints.
- Whitmore D., Pape T. & Cerretti P. 2013. Phylogeny of *Heteronychia*: the largest lineage of *Sarcophaga* (Diptera: Sarcophagidae). Zoological Journal of the Linnean Society 169: 604-639.
- Whitmore D., Richet R., Pape T. & Blackith R.M. 2009. Redescription of *Sarcophaga* (*Discachaeta*) *bezziana* Böttcher and *Sarcophaga* (*Heteronychia*) *infixa* Böttcher, and description of a new *Heteronychia* Brauer & Bergenstamm from southern France (Diptera: Sarcophagidae). Zootaxa 1993: 27-40.