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Subfamily Phlebotominae (Psychodidae, Diptera) of the United Arab Emirates – some new faunistic data

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Subfamily Phlebotominae (Psychodidae, Diptera) of the United Arab Emirates – some new faunistic data. – Acta Mus. Siles. Sci. Natur. 71: 207-222, 2022.

Abstract: Biting midges (Phlebotominae) are medically important vectors of human and veterinary disease-causing agents. This study presents the results of the field research of arthropods of A. van Harten in the United Arab Emirates (UAE) during the period of approximately 2005 – 2007 at a high number of localities (15 are mentioned here, with 9 species collected incl. five confirmed; 4 spp. are new for the fauna of the UAE: *Phlebotomus* (*Phlebotomus*) *papatasi* (Scopoli, 1786), *Sergentomyia* (*Parrotomyia*) *baghdadis* (Adler & Theodor, 1929), *S.* (*Sergentomyia*) *schwetzi* Adler, Theodor & Parrot, 1929, *S.* (*Grassomyia*) *squamipleuris* Newstead, 1912).

Key words: Arabian Peninsula, United Arab Emirates, faunistics, sand flies, new records, *Phlebotomus*, *Paraphlebotomus*, *Sergentomyia*, *Sintonius*, *Parrotomyia*, *Grassomyia,* reduced synonymy and references.

Introduction

Phlebotomines – sand flies (Diptera, Psychodidae, Phlebotominae) – are mainly known as vectors of *Leishmania* sp., protozoan parasites which cause visceral leishmaniasis and various forms of cutaneous leishmaniasis in man; they also transmit the sand fly fever virus throughout North Africa and the Middle East. There are more than 700 species of sand flies on the world (700 or so – see Lane, 1993); however, only one-tenth of the species represents the transmission of disease to man. *Phlebotomus* in the Old World is an anthropophagous genus; *Sergentomyia* feed on reptiles and will bite man without transmitting human parasites. The adults are very small (1.4–3.5 mm) and can be hard to catch without traps; finding larvae is almost impossible. The higher classification of sand flies is still controversy, and there is no universally accepted system. Seccombe *et al.* (1993) provide a checklist of Old World sand flies. The genus *Phlebotomus* has been revised by Lewis (1982) and Artemiev & Neronov (1984). The genus *Sergentomyia* is accounted in papers of e.g. Theodor (1958), Quate (1964), Perfil´ev (1966), Lewis (1978), Büttiker & Lewis (1983), Wagner (1990) and Lane (1993). Identification of sand flies is based mainly on internal structures and therefore requires specimens to be mounted on microscope slides; for suitable methods, see Theodor (1958, p. 10), Perfil´ev (1966, p. 188) and Lane (1993, p. 112).

The first checklist of sand flies of the UAE was published by van Harten (2005), with five registered species on the basis of literature data only published from Jebel Hafit by Hovarth & Gillett (2004), Lane & White (1981) and Lewis & Büttiker (1982). The first recorded specimen of a sand fly from the UAE (*Phlebotomus* sp., Dubai) was registered by Balfour (2003). Records of sand fly mites were published e.g. by Büttiker & Lewis (1983) and Lewis & Büttiker (1986).

The main goal of this work is to publish older, as yet unpublished, findings of sand flies of the UAE.

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Material and methods

The captured moth flies were preserved in 70% ethanol in the field in the UAE (A. van Harten leg.) and subsequently cleared in chloralphenol and treated in xylol, and selected specimens (182) were mounted on glass slides in Canada balsam in Prague (J. Ježek det.). The material is deposited in the National Museum, Prague, Czech Republic (NMPC). Observations were made using Carl Zeiss Jena (Germany) and Reichert (Austria) microscopes by the first author. The slides were numbered in the NMPC with Inv. No. = Inventory Slide Number of the family Psychodidae (25753 – 25918 for the UAE; for more information, see Tkoč *et al.* 2014). Used identification keys and nomenclature: Theodor (1958), Quate (1964, nice figures), Perfil´ev (1966), Lewis (1978, 1982), Artemiev & Neronov (1984) and Lane (1993). The microphotograph used was captured with a digital camera mounted on a Nikon eclipse TS-100F trinocular microscope (photo by M. Tkoč – see Fig. 5).

The UAE Insect Project was operating from Sharjah, most central to all the habitats in which vertebrates occur: sand deserts, stone deserts, mountains, montane creeks, mangroves, salt marshes, beaches, farmlands and urban areas.

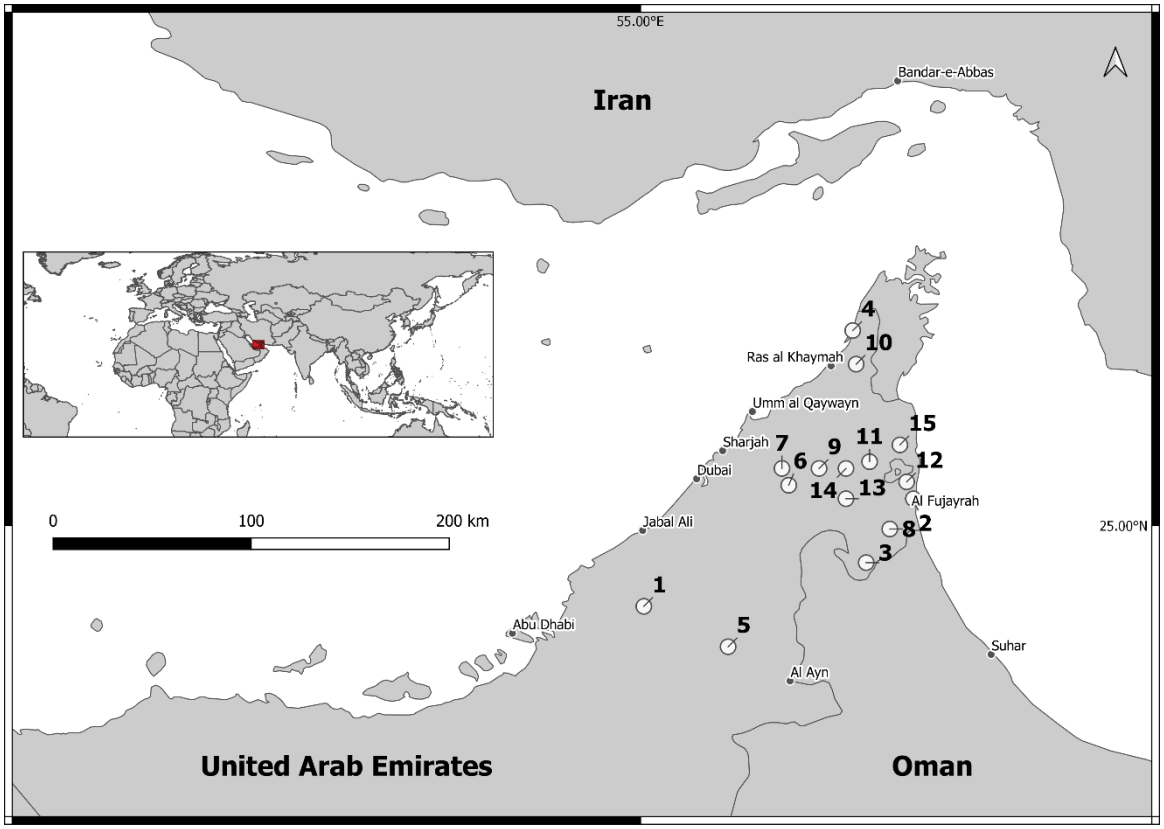
Methods used for collecting sand flies (Fig. 1):

Light traps (LT), malaise traps (MT), water traps (WT), yellow pan traps (YW), pitfall traps (PT), (?) an unknown method and as well as hand-collecting and sweep-netting.

Localities of UAE (see also Map 1):

1. Al-Ajban, 24°36'N 55°01'E, 60 m a.s.l.; the Al-Ajban estate is situated at 60 km of Abu Dhabi, some 35 km from the coastline. It comprises a large forested part, a monument artificial lake, some farm area and a big sand desert.
2. Fujairah, 25°08'N 56°21'E, 10 m a.s.l.; two small livestock farms lying a few km apart within the urban area Fujairah, mostly planted with date palms.
3. Hatta, 24°49'N 56°07'E, 315 m a.s.l.; two small farms in the Hatta region in rather dry mountainous area.
4. Khor al-Khwair, 25°58'N 56°03'E, 5 m a.s.l.; a small farm near the coastline mainly produced dates.
5. NARC near Sweihan, 24°24'N 55°26'E, 170 m a.s.l.; the National Avian Research Centre is situated in a sandy desert area, with very little plant life around its borders.
6. Near Mahafiz, 25°12'N 55°44'E, 110 m a.s.l.; the wadi Fayah, especially alongside the road running from the 10th bridge on the Sharjah-ad-Dhaid highway S and SE towards the al-Madam-ad-Dhaid road.
7. Sharjah Desert Park (Fig. 2), 25°17'N 55°42'E, 70 m a.s.l.; a complex of institutions (natural history museum, zoological garden and breeding centre for endangered species) at the highway from Sarjah to ad-Dhaid, 25 km E of Sarjah. A desert area, outside the park is much deteriorated due to overgrazing.
8. Sharjah x Khor Kalba (tunnel), 24°59'N 56°14'E, 580 m a.s.l.; two farms alongside the Sharjah – Khor Kalba highway, running in the middle of the wadi, a few km before the tunnel, negatively influenced the diversity of insects.
9. SSW of ad Dhaid, 25°17'N 55°53'E, 125 m a.s.l.; a border of the Sarjah Desert Park grazed by camels and goats.
10. Wadi Bih Dam, 25°48'N 56°04'E, 100 m a.s.l.; a river wadi with the dam. The vegetation of the valley sides is quite rich because of the permanent water.
11. Wadi Maidaq (Fig. 3), 25°19'N 56°08'E, 410 m a.s.l.; some 8 km NW of Masafi and only about one hour drive from Sarjah a valley with rich mountain vegetation.
12. Wadi Safad, 25°13'N 56°19'E, 150 m a.s.l.; Quragya is the entrance to this wadi, some 10 km N of Fujeirah. The road goes westward and finishes after 5 km in a newly built dam. A steep valley with date palm-trees.
13. Wadi Shawkah, 25°08'N 56°01'E, 305 m a.s.l.; a few km N of Shawkah village the road (in direction of Mana-ma) crosses this permanent water stream. Partially abandoned date farms, big dam and a reservoir.
14. Wadi Siji, 25°17'N 56°01'E, 246 m a.s.l.; a typical wadi landscape as mentioned in localities above, with perio-dical water pools.
15. Wadi Wurayah (Fig. 4), 25°24'N 56°17'E, 165 m a.s.l.; one of the richest areas of arthropods in the UAE. The area is 129 km^2 in size and is located SW of the village Bidiyah (highest point 956 m a.s.l.), primary wadi is 27.5 km long. Significant rainfalls, permanent water flows, pools and waterfalls.

The paragraph "Review of species with selected citations" is laid out as follows: valid scientific name, detailed list of synonyms (with a reference), taxon (subgenus) classification, a list of collecting sites, species distribution and comments (if available).



Map 1: Map of the United Arab Emirates with the collecting sites, prepared by P. Manko.



Fig 1: Methods used for collecting sand flies, photos by A. van Harten.



Fig 2: Sharjah Desert Park (site 7), photo by A. van Harten.



Fig 3: Wadi Maidaq (site 11), photo by A. van Harten.



Fig 4: Wadi Wurayah (site 15), photo by A. van Harten.

Note: The detailed and up-to-date distribution of individual species is available here: European Centre for Disease Prevention and Control and European Food Safety Authority. Phlebotomine sand flies maps [internet]. Stockholm: ECDC; current known distribution: October 2021. Available from: https://ecdc.europa.eu/en/disease-vectors/surveillance-and-disease-data/phlebotomine-maps

Results

Review of species with selected citations

Phlebotomus (*Paraphlebotomus*) *alexandri* Sinton, 1928

Phlebotomus sergenti var. *alexandri;* Sinton (1928c: 308), Adler *et al*. (1930: 533).

Phlebotomus alexandri Sinton; Sinton (1932a: 58), Lane (1986: 9), Harten van (2005: 56), Vaselek *et al.* (2019: 5), Boutsini *et al*. (2018: 109), Vatandoost *et al*. (2018: 46), Dvorak *et al.* (2020: 5), Kassiri & Nezhad (2021: 208).

Phlebotomus (*Phlebotomus*) *alexandri* Sinton; Parrot (1940: 310), Abonnenc (1972: 102), Guevara-Benîtez *et al.* (1978: 833).

Phlebotomus (*Paraphlebotomus*) *alexandri* Sinton; Theodor (1958: 19), Theodor & Mesghali (1964: 290), Lewis (1967: 15), Perfil´ev (1968: 241), Croset (1969: 285), Artemiev (1978: 17), Croset *et al.* (1978: 728), Duckhouse & Lewis (1980: 100), Lewis & Bütiker (1980: 259), Wagner (1990: 14), Ježek *et al*. (2017: 113), Ježek *et al*. (2018: 112), Oboňa *et al*. (2019a,b: 308), Koleeby *et al.* (2021: 2).

The species is currently placed in the subgenus *Paraphlebotomus* Theodor.

Localities. Wadi Maidaq (site 11), 1 ♂, 28.xi.-1.xii.2005, YW, WT; 2 ♂♂, 26.xii.2005-2.i.2006, YW, WT; 1 ♂, 7-14.iii.2006, YW, WT; 1 ♂, 18.-28.xi.2007, WT.

Distribution. Afghanistan, Algeria, Armenia, Azerbaijan, Bulgaria, China, Cyprus, Djibouti area, Egypt, Ethiopia, Georgia, Greece, N. W. India, Iran, Iraq, Israel, Kazakhstan, Kosovo, Kuwait, Morocco, North Macedonia, Pakistan, Romania, Saudi Arabia, Spain, Sudan, Tunisia, Turkey, Turkmenistan, UAE, Ukraine, Serbia, southern part of the former USSR, Yemen and South Yemen. Palaearctic, Afrotropical and Oriental Regions.

Phlebotomus (*Phlebotomus*) *bergeroti* Parrot, 1934

Phlebotomus papatasi var. *bergeroti;* Parrot (1934: 383), Parrot & Bellon (1952: 60).
Phlebotomus (*Phlebotomus*) *viduus;* Parrot (1936a: 34).
Phlebotomus bergeroti Parrot, 1934; Harten van (2005: 56).
Phlebotomus (*Phlebotomus*) *bergeroti* Parrot, 1934; Theodor (1958: 16), Perfil´ev (1968: 66), Artemiev (1978: 16), Duckhouse & Lewis (1980: 100), Lewis & Bütiker (1980: 259), Wagner (1990: 13), Koleeby *et al.* (2021: 2).

The species is currently placed in the subgenus *Phlebotomus* Rondani & Berté.

Localities. Sharjah x Khor Kalba nr. tunnel (site 8), 1 ♂, 31.v-17.vi.2006, ?. Wadi Shawkah (site 13), 1 ♂, 9-24.vi.2007, WT; 1 ♂, 30.vi-2.viii.2007, WT.

Distribution. Afghanistan, Algeria, Djibouti area, Ethiopia, Iran, Mauretania, Morocco, Saudi Arabia, Somalia, South Yemen, Sudan, UAE, Yemen. Asia, North Africa, northern parts of the Afrotropical Region.

Phlebotomus (*Phlebotomus*) *papatasi* (Scopoli, 1786)

Bibio papatasi; Scopoli (1786: 55).
Flebotomus papatasii (Scopoli); Rondani (1840: 13), Costa (1843: 4).
Hebotomus papatasii (Scopoli); Rondani (1843: 265).
Hebotomus molestus (Costa); Rondani (1843: 266).
Phlebotomus papatasi (Scopoli); Loew (1847: 151), Theodor (1938: 165), De Meillon & Lavoipierre (1944: 41), Saccà (1950: 684), Abonnenc (1958: 63), Schmidt & Schmidt (1962: 722), Bhat & Modi (1976: 265), Lysenko & Beliaev (1977b: 263), Guevara-Benîtez *et al.* (1978: 824), Lane (1986: 15).
Musca papatasii (Scopoli); Rondani (1856: 178).
Phlebotomus (*Phlebotomus*) *papatasi* var. *breviventris*; Ristorcelli (1941: 369).
Phlebotomus (*Phlebotomus*) *papatasi* (Scopoli); Parrot (1937: 111), Ristorcelli (1939: 237), Kirk & Lewis (1940: 627), Theodor (1948: 86), Parrot (1953: 115), Fairchild (1955: 188), Lewis & Kirk (1957: 632), Theodor (1958: 17), Qutubuddin (1962: 594), Quate (1964: 240), Perfil´ev (1968: 252), Croset (1969: 360), Rioux & Golvan (1969: 68), Bailly-Choumara *et al*. (1971: 436), Artemiev (1972: 300), Biocca *et al*. (1977a: 158), Artemiev (1978: 15), Lewis (1978b: 233), Croset *et al*. (1978: 726), Duckhouse & Lewis (1980: 101), Lewis & Büttiker (1980: 259), Wagner (1990: 13), Gugushvili & Lomtadze (2002: 238), Ježek *et al*. (2017: 111), Vahabi *et al.* (2017: 83), Ježek *et al*. (2018: 112), El Aasri *et al*. (2018: 4), Boutsini *et al*. (2018: 109), Ramdane & Berchi (2018: 2823), Vatandoost *et al*. (2018: 45), Oboňa *et al*. (2019a,b: 308), Vaselek *et al.* (2019: 5), Moradi-Asl *et al.* (2019: 183), Dvorak *et al*. (2020: 5), Al-Koleeby *et al*. (2021: 2), Kassiri & Nezhad (2021: 208), Amira *et al*. (2022: 5).
Phlebotomus papatasi papatasi (Scopoli); Abonnenc & Rioux (1961: 31).

For the comprehensive nomenclatural history, see Quate (1964) and Lewis (1972, 1978 and 1982).

The species is currently placed in the subgenus *Phlebotomus* Rondani & Berté.

Localities. Fujairah (site 2), 1 ♀, 2.-26.i.2006, LT. Hatta (site 3), 1 ♀, 17.-24.viii.2006, LT. Khor al-Khwair (site 4), 1 ♀, 16.-23.v.2007, LT. Near Mahafiz (site 6), 1 ♀, 21.-28.viii.2006, LT. Sharjah x Khor Kalba nr. tunnel (site 8), 1 ♀, 7.-14.vi.2006, LT. Wadi Maidaq (site 11), 1 ♂, 16.xi.-26.xii.2006, MT; 1 ♂, 18.-28.xi.2007, WT. Wadi Safad (site 12), 1 ♀, 28.xi.-1.xii.2005, YW, WT; 1 ♀, 2.-26.i.2006, YW, WT; 1 ♀, 17.-24.vi.2006, LT.

Distribution. Afghanistan, Algeria, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Chad, Croatia, Cyprus, Egypt, Eritrea, Ethiopia, France, Georgia, Greece, Hungary, India, Iran, Iraq, Israel, Italy, Jordan, Kazakhstan, Kosovo, Kuwait, Libya, Malta, Moldavia, Morocco, North Macedonia, Oman, Pakistan, Romania, Sardinia, Saudi Arabia, Serbia, Slovenia, Somalia, Southern Yemen, Spain, Sudan, Syria, Tunisia, Turkey, Ukraine, former USSR, Yemen, former Yugoslavia. **New for the fauna of UAE.** Europe, Asia, northern parts of the Oriental and Afrotropical Regions; Western part of the Old World, North Africa, Mediterranean area east to Indian subcontinent.

Sergentomyia (*Sintonius*) *adleri* (Theodor, 1933)

Phlebotomus adleri; Theodor (1933: 537), De Meillon & Lavoipierre (1944: 38), Rageau (1951: 795), Abonnenc (1962: 220).
Phlebotomus (*Prophlebotomus*) *adleri*; Kirk & Lewis (1940: 630), Parrot & Bellon (1952: 60), Abonnenc & Rioux (1961: 42).
Phlebotomus (*Sintonius*) *adleri*; Kirk & Lewis (1946a: 42); Heisch *et al*. (1956: 212), Lewis & Kirk (1957: 638).
Sergentomyia adleri; Harten van (2005: 56).

Sergentomyia (*Sintonius*) *adleri*; Qutubuddin (1962: 594), Duckhouse & Lewis (1980: 104), Lewis & Büttiker (1980: 264), Lane (1986: 17), Wagner (1990: 20).

Synonymy after Quate (1964) – reduced, adapted.

The species is currently placed in the subgenus *Sintonius* Nitzulescu.

Localities. Sharjah Desert Park (site 7), 1 ♀, 6.-30.iv.2005, LT; 1 ♂, 1 ♀, 30.iv.-31.v.2005, LT; 1 ♀, 20.x.-8.xi.2005, LT; 1 ♂, 2 ♀♀, 13.xi.-11.xii.2005, LT; 1 ♀, 25.ii-25.iii.2006, LT; 1 ♀, 6.-28.xii.2006, PT; 1 ♀, 8.-15.iv.2007, LT; 1 ♀, 12.-21.v.2007, LT; 1 ♂, 22.v.-4.vi.2007, LT; 1 ♀, 20.x.-24.xi.2007, LT; 4 ♀♀, 24.xi.-22.xii.2007, LT; 1 ♀, 14.ii.-1.iv.2008, LT. SSW of ad Dhaid (site 9), 1 ♂, 13.-18.xii.2005, PT, YW, WT. Wadi Bih Dam (site 10), 1 ♂, 24.iv.-1.v.2007, LT. Wadi Maidaq (site 11), 1 ♂, 14.-25.i.2006, YW, WT; 1 ♀, 29.iii.-10.iv.2006, YW, WT. Wadi Safad (site 12), 1 ♂, 26.xii.2005-2.i.2006, YW, WT; 1 ♂, 28.xi.-1.xii.2005, YW, WT. Wadi Shawkah (site 13), 1 ♂, 19.-28.xi.2007, WT. Wadi Wurayah (site 15), 1 ♀, 12.-14.iv.2005, MT, WT, PT.

Distribution. Cameroon, CAR, Chad, Egypt, Eritrea, Ghana, Ivory Coast, Kenya, Nigeria, Saudi Arabia, Senegal, Sudan, Togo, UAE, Upper Volta. Asia and Afrotropical Region.

Comments. This species is closely similar to *S. clydei* and has been considered synonymous by some authors, though not here.

Sergentomyia (*Sergentomyia*) *antennata* (Newstead, 1912)

Phlebotomus antennatus; Newstead (1912:365), Kirk & Lewis (1949: 334), Parrot (1951b: 130), Parrot & Bellon (1952: 61), Abonnenc (1958: 315).
Phlebotomus (*Prophlebotomus*) *antennatus*; Kirk & Lewis (1946a: 47), Parrot & Clastrier (1956: 513).
Phlebotomus (*Sergentomyia*) *antennatus*; Kirk & Lewis (1951: 452), Heisch *et al.* (1956: 213); Lewis & Kirk (1957: 636).
Sergentomyia antennata; Harten van (2005: 56), Vahabi *et al*. (2017: 84), Kassiri & Nezhad (2021: 208).
Sergentomyia (*Sergentomyia*) *antennata*; Theodor (1948: 108), Qutubuddin (1962: 595), Duckhouse & Lewis (1980: 103), Lewis & Büttiker (1980: 267), Lane (1986: ?), Wagner (1990: 23), Al-Koleeby *et al*. (2021: 208).
Phlebotomus minutus var. *antennatus*; Parrot (1930: 189), De Meillon & Lavoipierre (1944: 41).
Phlebotomus signatipennis; Newstead (1920: 305), Parrot & Joliniere (1945: 56).
Phlebotomus (*Prophlebotomus*) *signatipennis*; Parrot *et al*. (1945: 286), Parrot (1946: 59), Kirk & Lewis (1946a: 46).
Phlebotomus minutus var. *signatipennis*; Theodor (1938: 172), De Meillon & Lavoipierre (1944: 41), Kirk & Lewis (1940: 628), Parrot (1942: 323).
Phlebotomus (*Sergentomyia*) *antennatus* var. *signatipennis*; Kirk & Lewis (1951: 454).
Phlebotomus antennatus var. *signatipennis*; Rageau (1951: 794).
Phlebotomus sanneri; Galliard & Nitzulescu (1931: 233), Parrot (1938: 213), De Meillon & Lavoipierre (1944: 41).
Phlebotomus (*Prophlebotomus*) *sanneri*; Parrot (1936: 45).
Phlebotomus minutus var. *occidentalis*; Theodor (1933: 539); De Meillon & Lavoipierre (1944: 42).
Phlebotomus (*Prophlebotomus*) *occidentalis*; Kirk & Lewis (1946a: 48), Parrot (1946: 69).
Phlebotomus (*Sergentomyia*) *antennatus* var. *occidentalis*; Kirk & Lewis (1951: 455).
Phlebotomus (*Prophlebotomus*) *cinctus*; Parrot & Martin (1944: 56), Parrot (1946: 72), Kirk & Lewis (1946a: 47).
Phlebotomus (*Prophlebotomus*) *antennatus* var. *cinctus*; Parrot & Clastrier (1960: 75).
Phlebotomus (*Sergentomyia*) *antennatus* var. *cinctus*; Kirk & Lewis (1951: 456).
Sergentomyia (*Sergentomyia*) *cincta*; Theodor (1958: 38).

Synonymy after Quate (1964) – reduced, adapted.

The species is currently placed in the subgenus *Sergentomyia* França & Parrot.

Localities. Fujairah (site 2), 1 ♀, 6.iv.-2.v.2005, LT. Khor al-Khwair (site 4), 1 ♀, 30.v.-5.vi.2007, LT. Near Mahafiz (site 6), 2 ♀♀, 21.-28.viii.2006, LT. Sharjah x Khor Kalba nr. tunnel (site 8), 1 ♂, 1 ♀, 24.-30.v.2006, LT; 2 ♀♀, 31.v.-17.vi.2006, LT; 1 ♀, 7.-14.vi.2006, ?. Wadi Maidaq (site 11), 1 ♀, 2.-16.ii.2006, LT; 1 ♀, 29.vii.-26.viii.2006, MT. Wadi Safad (site 12), 1 ♂, 1 ♀, 17.-24.vi.2006, LT. Wadi Shawkah (site 13), 2 ♂♂, 9.-24.vi.2007, WT. Wadi Wurayah (site 15), 1 ♀, 12.-14.iv.2005, MT, WT, PT.

Distribution. Algeria, Cameroon, CAR, Chad, former Congo, Dahomey, Egypt, Eritrea, Ethiopia, French Somaliland (the Republic of Djibouti), Gabon, Ghana, Iran, Israel, Ivory Coast, Kenya, Kuwait, Mali, Morocco, Nigeria, Saudi Arabia, Senegal, Somalia, Sudan, Tunisia, UAE, Uganda, Yemen. Afrotropical Region.

Sergentomyia (*Parrotomyia*) *baghdadis* (Adler & Theodor, 1929)

Phlebotomus baghdadis; Adler & Theodor (1929: 281), Sinton (1932a: 60).
Sergentomyia (*Parrotomyia*) *baghdadis* (Adler & Theodor, 1929); Lewis (1967: 30), Artemiev (1976b: 424), Wagner (1990: 24), Chandra *et al.* (2018: 745).
Sergentomyia baghdadis; Theodor (1958: 43), Perfil´ev (1966: 110), Kassiri & Nezhad (2021: 208).

Synonymy after Lewis (1978) – adapted.
The species is currently placed in the subgenus *Parrotomyia* Theodor.

Localities. Fujairah (site 2), 1 ♀, 28.ii.-1.iv.2006, LT. Wadi Maidaq (site 11), 1 ♀, 26.viii.-9.ix.2006, MT. Wadi Shawkah (site 13), 1 ♀, 19.-28.xi.2007, WT.

Distribution. Afghanistan, India, Iran, Iraq, Pakistan. **New for the fauna of the UAE.**

Sergentomyia (*Sintonius*) *clydei* (Sinton, 1928) - see also Fig. 5

Phlebotomus clydei; Sinton (1928b: 179), Lewis & Kirk (1939: 155), Kirk & Lewis (1948: 326), Rageau (1951: 795).
Phlebotomus (*Prophlebotomus*) *clydei* Sinton; Kirk & Lewis (1940: 630), Parrot (1940: 312), Parrot & Martin (1944: 55), Parrot *et al*. (1945: 232), Parrot & Clastrier (1960: 73), Abonnenc & Rioux (1961: 35).
Phlebotomus (*Sintonius*) *clydei*; Kirk & Lewis (1946a: 42), Heisch *et al*. (1956: 212), Lewis & Kirk (1957: 638).
Sergentomyia clydei; Harten van (2005: 56), Al-Koleeby *et al*. (2021: 2), Kassiri & Nezhad (2021: 208).
Sergentomyia (*Sintonius*) *clydei* (Sinton); Theodor (1958: 51), Theodor & Mesghali (1964: 297), Lewis (1967: 42), Perfil´ev (1968: 347), Artemiev (1976a: 37), Duckhouse & Lewis (1980: 104), Lewis & Büttiker (1980: 265), Lane (1986: 20), Wagner (1990: 21).
Phlebotomus (*Prophlebotomus*) *vagus;* Parrot & Martin (1939: 147).
Phlebotomus (*Prophlebotomus*) *viator;* Parrot & Martin (1939: 153), Kirk & Lewis (1946a: 50).

Synonymy after Quate (1964) and Lewis (1978) – reduced, adapted.
The species is currently placed in the subgenus *Sintonius* Nitzulescu.

Localities. Al-Ajban (site 1), 1 ♂, 7.-28.xii.2007, LT, MT. Fujairah (site 2), 1 ♂, 6.iv.-2.v.2005, LT. Hatta (site 3), 1 ♂, 1 ♀, 4.-11.iv.2006, LT; 1 ♂, 8.-26.iv.2006, LT; 1 ♀, 24.-30.v.2006, LT. Khor al-Khwair (site 4), 1 ♀, 2.-13.v.2007, LT; 1 ♂, 16.-23.v.2007, LT; 1 ♀, 30.v.-5.vi.2007, LT. NARC nr. Sweihan (site 5), 1♀, 2.-30.iv.2005, LT. Sharjah Desert Park (site 7), 1 ♂, 21.-29.iii.2005, LT; 1 ♂, 1 ♀, 29.iii.-6.iv.2005, LT; 1 ♂, 6.-30.iv.2005, LT; 1 ♂, 30.iv.-31.v.2005, LT; 1 ♂, 1 ♀, 31.v.-30.vi.2005, LT; 1 ♂, 1 ♀, 21.vii.-5.viii.2005, LT; 1 ♂, 20.x.-8.xi.2005, LT; 1 ♀, 11.xii.2005-18.i.2006, LT; 1 ♂, 18.i.-25.ii.2006, LT; 1 ♂, 6.-28.xii.2006, PT; 1 ♀, 3.-10.iii.2007, LT; 1 ♂, 17.-24.iii.2007, LT; 1 ♀, 5.-12.v.2007, LT; 1 ♂, 12.-21.v.2007, LT; 1 ♂, 28.v.-4.vi.2007, LT; 1 ♂, 4.-9.vi.2007, LT; 1 ♂, 1 ♀, 20.x.-10.xi.2007, LT; 1 ♂, 20.x-24.xi.2007, LT; 1 ♂ (Fig. 5), 24.xi.-22.xii.2007, LT. Sharjah x Khor Kalba (site 8), 1 ♀, 7.-14.vi.2006, LT. SSW of ad Dhaid (site 9), 1 ♂, 27.xi.-1.xii.2005, YW, WT; 1 ♀, 13.-18.xii.2005, PT, YW, WT. Wadi Bih Dam (site 10), 1 ♀, 24.iv.-1.v.2007, LT. Wadi Maidaq (site 11), 1 ♂, 28.xi.-1.xii.2005, YW, WT; 1 ♀, 26.xii.2005-2.i.2006, YW, WT; 1 ♂, 2 ♀♀, 14.-25.i.2006, YW, WT; 1 ♂, 4.-15.ii.2006, YW, WT; 1 ♀, 12.-15.ii.2006, YW, WT; 1 ♂, 1 ♀, 29.iii.-10.iv.2006, WY, WT, YPT; 1 ♂, 29.vii.-26.viii.2006, MT; 1 ♂, 26.viii.-9.ix.2006, MT; 2 ♂♂, 1 ♀, 24.ix.-22.x.2006, WT; 1 ♂, 1 ♀, 26.x.-9.xi.2006, WT; 1 ♂, 1 ♀, 18.-28.xi.2007, WT; 1 ♀, 20.i.-3.ii.2008, WT. Wadi Safad (site 12), 1 ♂, 1 ♀, 27.xi.-22.xii.2005, LT; 1 ♂, 1 ♀, 20.xii.2005-2.i.2006, LT; 1 ♂, 1 ♀, 26.xii.2005-2.i.2006, YW, WT; 2 ♂♂, 2.-26.i.2006, YW, WT; 1 ♂, 31.i.-21.ii.2006, LT; 1 ♂, 14.-21.v.2006, LT. Wadi Shawkah (site 13), 1 ♂, 1 ♀, 31.x.-27.xi.2006, WT; 1 ♂, 5.-12.v.2007, WT; 1 ♀, 9.-24.vi.2007, WT; 1 ♂, 1 ♀, 30.vi.-2.viii.2007, WT; 1 ♂, 1 ♀, 25.x.-15.xi.2007, WT. Wadi Siji (site 14), 1 ♂, 1 ♀, 24.ix.-22.x.2006, WT; Wadi Wurayah (site 15), 2 ♂♂, 12.-14.iv.2005, MT, WT, PT; 1 ♂, 1 ♀, 25.iv.-2.v.2007, MT.

Distribution. Afghanistan, Aldabra (island in the Indian Ocean), Algeria, Egypt, Cameroon, Chad, Eritrea, Ethiopia, Fr. Somaliland, Ghana, northern India, Iran, Iraq, Kazakhstan, Kenya, Kuwait, Mali, Morocco, Niger, Pakistan, Saudi Arabia, Senegal, Somalia, Sudan, Tajikistan, Turkestan, UAE, Yemen. Middle East, Central Asia, Afrotropical and Oriental Regions.

Comments. Here in this paper not conspecific with *S. adleri*; there are differences in the number of horizontal and vertical teeth on the cybarium.

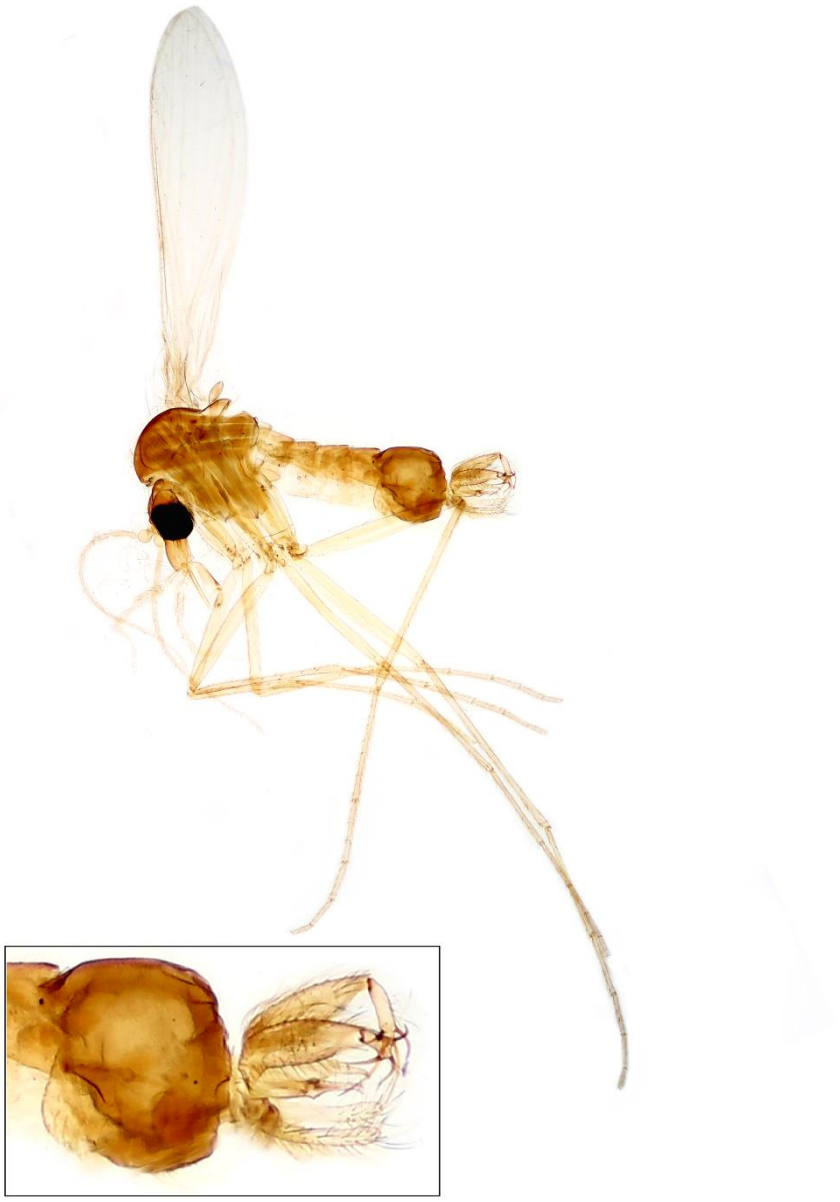


Fig 5: *Sergentomyia* (*Sintonius*) *clydei* (Sinton, 1928), male. Sharjah Desert Park (site 7), Inv. No. 25918, photo by M. Tkoč.

Sergentomyia (*Sergentomyia*) *schwetzi* Adler, Theodor & Parrot, 1929

Phlebotomus schwetzi; Adler *et al*. (1929: 75), Parrot (1930: 182), Theodor (1938: 172), De Meillon & Lavoipierre (1944: 42), Parrot & Joliniere (1945: 56), Rageau (1951: 794), De Meillon & Hardy (1953: 32), Abonnenc (1959: 591).

Phlebotomus (*Prophlebotomus*) *schwetzi*; Parrot (1937: 118), Kirk & Lewis (1940: 629), Parrot & Malbrant (1945: 121), Parrot *et al*. (1945: 240), Parrot & Martin (1945: 279), Kirk & Lewis (1946: 49), Rageau & Adam (1953: 587), Abonnenc & Rioux (1961: 44).

Phlebotomus (*Sergentomyia*) *schwetzi*; Kirk & Lewis (1951: 470), Heisch *et al.* (1956: 214), Lewis & Kirk (1957: 636).

Sergentomyia (*Sergentomyia*) *schwetzi*; Theodor (1948: 110), Qutubuddin (1962: 595), Duckhouse & Lewis (1980: 104), Lewis & Büttiker (1980: 268), Lane (1986: 23), Wagner (1990: 24), Al-Koleeby *et al.* (2021: 2).

Phlebotomus symesi; Sinton (1930: 175).
Phlebotomus (*Prophlebotomus*) *schwetzi* var. *aethiopicus*; Parrot (1936a: 39), Kirk & Lewis (1940: 629).
Phlebotomus schwetzi var. *aethiopicus;* Parrot (1938: 213), De Meillon & Lavoipierre (1944: 42).
Phlebotomus (*Prophlebotomus*) *horgani;* Kirk & Lewis (1948: 323).

Synonymy after Quate (1964) – reduced, adapted.

The species is currently placed in the subgenus *Sergentomyia* França & Parrot.

Localities. Fujairah (site 2), 1 ♀, 24.ii.-5.iii.2005, LT. Sharjah Desert Park (site 7), 1 ♀, 28.v.-4.vi.2007, LT.

Distribution. Algeria, Cameroon, Chad, China, People's Republic of the Congo, Egypt, Eritrea, Ethiopia, Ghana, Guinea, JAR, Kenya, Mali, Morocco, Nigeria, Saudi Arabia, Senegal, Sudan, Uganda, Yemen, Zaire. **New for the fauna of the UAE.** Afrotropical Region.

Sergentomyia (*Grassomyia*) *squamipleuris* Newstead, 1912

Phlebotomus squamipleuris; Newstead (1912: 366), Parrot (1930: 182), Theodor (1931: 470), De Meillon & Lavoipierre (1944: 42), De Meillon & Hardy (1953: 32).
Phlebotomus (*Prophlebotomus*) *squamipleuris*; Parrot (1937: 119), Kirk & Lewis (1940: 630), Parrot & Martin (1944: 56), Parrot *et al*. (1945: 240), Parrot (1946: 72), Kirk & Lewis (1946a: 50).
Phlebotomus (*Sergentomyia*) *squamipleuris*; Kirk & Lewis (1951: 488), Heisch *et al*. (1956: 214), Lewis & Kirk (1957: 637), Quate (1962: 259).
Sergentomyia (*Sergentomyia*) *squamipleuris*; Theodor (1948: 112), Kassiri & Nezhad (2021: 208).
Sergentomyia (*Grassomyia*) *squamipleuris*; Theodor (1958: 47), Qutubuddin (1962: 595), Duckhouse & Lewis (1980: 101), Lane (1986: 25), Wagner (1990: 20).
Phlebotomus squamipleuris var. *dreyfussi*; Parrot (1933: 603), De Meillon & Lavoipierre (1944: 43).
Phlebotomus (*Prophlebotomus*) *squamipleuris* var. *dreyfussi*; Ristorcelli (1941: 521), Parrot (1946: 72), Kirk & Lewis (1946a: 50), Parrot & Durand-Delacre (1947: 77), Parrot & Clastrier (1960: 75).
Phlebotomus (*Sergentomyia*) *squamipleuris* var. *dreyfussi*; Kirk & Lewis (1951: 489).
Sergentomyia (*Grassomyia*) *squamipleuris dreyfussi*; Theodor (1958: 47).
Phlebotomus squamipleuris var. *inermis;* Theodor (1938: 165), Parrot & Martin (1939: 155), De Meillon & Lavoipierre (1944: 43).
Phlebotomus (*Prophlebotomus*) *squamipleuris* var. *inermis*; Parrot (1946: 72), Kirk & Lewis (1946a: 50).
Phlebotomus (*Sergentomyia*) *squamipleuris* var. *inermis*; Kirk & Lewis (1951: 491), Lewis & Kirk (1957: 637).
Sergentomyia (*Grassomyia*) *squamipleuris inermis*; Qutubuddin (1962: 595).
Sergentomyia (*Grassomyia*) *squamipleuris haseebi;* Qutubuddin (1962: 602).
Phlebotomus ghesquieri; Parrot (1929: 1).

Synonymy after Quate (1964) – reduced, adapted.

The species is currently placed in the subgenus *Grassomyia* Theodor.

Localities. Hatta (site 3), 1 ♀, 8.-26.iv.2006, LT. Sharjah Desert Park (site 7), 1 ♀, 18.i.-25.ii.2006, ?. Sharjah x Khor Kalba (site 8), 1 ♀, 7.-22.iii.2006, LT. Wadi Bih Dam (site 10), 1 ♀, 22.ii.-1.iii.2007, LT; 1 ♂, 1 ♀, 1.-8.iii.2007, LT; 1 ♀, 15.-22.iii.2007, LT; 1F, 24.iv.-1.v.2007, LT; 1 ♀, 19.ii.-1.iii.2008, LT; 1 ♀, 1.-6.iii.2008, LT; 1 ♀, 6.-17.iii.2008, LT; 1 ♀, 17.-25.iii.2008, LT. Wadi Maidaq (site 11), 1 ♀, 2.-16.ii.2006, LT; 1 ♀, 2.-17.ii.2008, WT; 2 ♀♀, 29.iii.-10.iv.2006, WT, YPT. Wadi Safad (site 12), 1 ♀, 2.-26.i.2006, YW, WT; 1 ♀, 15.-22.iv.2006, LT; 1 ♀, 14.-21.v.2006, LT. Wadi Shawkah (site 13), 1 ♀, 1.-7.iv.2007, WT; 1 ♀, 19.-22.v.2007, WT.

Distribution. Algeria, China, People's Republic of the Congo, Dahomey, Egypt, Eritrea, Ethiopia, India, Iran, Iraq, Israel, Ivory Coast, Kenya, Kuwait, Mali, Madagascar, Mozambique, Nigeria, Pakistan, Saudi Arabia, Senegal, Sudan, Uganda. **New for the fauna of the UAE.** Widespread, Middle East, Afrotropical and Oriental Regions.

Discussion

A. van Harten briefly summarised the history of research of the arthropod fauna of the Arabian Peninsula in *Arthropod Fauna of the United Arab Emirates* (Vol. 1, 2008). Prior to 2005 only 830 species of insects were known in the UAE (A. van Harten – Insects of the UAE, A Checklist of Published Records. Dar Al Ummah Printing, Abu Dhabi, 86 pp.). The initiative to obtain better knowledge of the insect fauna of the UAE was taken solely by His Highness Sheikh Tahnoon Bin Zayed Al Nahyan (patron of the research project). Van Harten (the last co-author in the heading of this submitted paper) started the research from scratch in August 2004

and managed to collect and sort enormous quantities of insects and to secure the collaboration of many (tens of) specialists from various countries (see published Vols. 1-6).

The non-biting subfamily Psychodinae (Diptera, Psychodidae) was published in Vol. 2 (Ježek & van Harten, 2009), the family Tabanidae (Diptera) in Vol. 6 (Ježek, Tkoč & van Harten, 2017) and the biting subfamily Phlebotominae (Diptera, Psychodidae) is being prepared here in this paper (unfortunately, the formerly planned Vol. 7 has been never completed and published).

List of registered species

species	**confirmed**	**new for the UAE**
Phlebotomus (*Paraphlebotomus*) *alexandri* Sinton, 1928	x	
Phlebotomus (*Phlebotomus*) *bergeroti* Parrot, 1934	x	
Phlebotomus (*Phlebotomus*) *papatasi* (Scopoli, 1786)		x
Sergentomyia (*Sintonius*) *adleri* (Theodor, 1933)	x	
Sergentomyia (*Sergentomyia*) *antennata* (Newstead, 1912)	x	
Sergentomyia (*Parrotomyia*) *baghdadis* (Adler & Theodor, 1929)		x
Sergentomyia (*Sintonius*) *clydei* (Sinton, 1928)	x	
Sergentomyia (*Sergentomyia*) *schwetzi* Adler, Theodor & Parrot, 1929		x
Sergentomyia (*Grassomyia*) *squamipleuris* Newstead, 1912		x

Currently, a total of 9 species of sand flies are known from the United Arab Emirates. *Phlebotomus* (*P.*) *papatasi*, *Sergentomyia* (*Parrotomyia*) *baghdadis, Sergentomyia* (*S.*) *schwetzi* and *Sergentomyia* (*Grassomyia*) *squamipleuris* represent the first records for the UAE.

Overall, during this study 164 sand fly samples were captured. Among the most numerous are *S.* (*S.*) *clydei* with 80 samples from a total of 14 sites, followed by *S.* (*S.*) *adleri* with 26 samples from 6 sites, *S.* (*G.*) *squamipleuris* with 20 samples from 7 sites, and *S.* (*S.*) *antennata* with 15 samples from 8 sites. Other species were presented with 10 samples or fewer (*P.* (*P.*) *papatasi* 10 samples from 7 sites, *P.* (*P.*) *alexandri* with 5 samples from 1 site, *S.* (*P.*) *baghdadis* with 3 samples from 3 sites, *P.* (*P.*) *bergeroti* with 3 samples from 2 sites, and *S.* (*S.*) *schwetzi* with 2 samples from 2 sites).

Among the species with the highest frequency of occurrence are *S.* (*S.*) *clydei* (with cca 90% frequency), followed by *S.* (*S.*) *antennata* (with cca 50% frequency), *P.* (*P.*) *papatasi* and *S.* (*G.*) *squamipleuris* with cca 45% frequency, and *S.* (*S.*) *adleri* with 40% frequency. Other species had a frequency below 20%.

Among the most effective capture methods for sand flies in the present study from the United Arab Emirates were light traps (LT) with cca 50% of all captured samples. Followed by water traps (WT) with cca 30%, and yellow pan traps (YW) with cca 14%. Other methods (malaise traps (MT), pitfall traps (PT)) captured less than 10% of all sand fly samples.

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