

BLACK FLIES (DIPTERA: SIMULIIDAE) RECORDS FROM EAST MARMARA REGION

Ümit D. Şirin*, Ebru Ceren Fidan*,
Hakan Çalışkan* and Yalçın Şahin*

* Eskişehir Osmangazi University, Faculty of Art and Science, Department of Biology, 26480, Eskişehir, TURKEY. E-mail: usirin@ogu.eud.tr

[Şirin, Ü. D., Fidan, E. C., Çalışkan, H. & Şahin, Y. 2014. Black flies (Diptera: Simuliidae) records from East Marmara Region. *Munis Entomology & Zoology*, 9 (2): 822-831]

ABSTRACT: This paper presents 17 species of black flies recorded from 99 lotic sites in East Marmara Region in summer of 2001, 2002 and 2003. All species are recorded from this region for the first time and distributional remarks both in Turkey and World are given for each species.

KEY WORDS: Black flies, Simuliidae, Turkey, biodiversity, fauna.

Black flies are medically, economically and ecologically important insects belonging to the family Simuliidae, suborder Nematocera order Diptera (Crosskey, 1990). Adult females of most simuliid species feed on vertebrate blood. As a consequence, some are among the most important insect pests of humans and animals. They are the sole vectors responsible for human onchocerciasis, or river blindness, which causes visual impairment and skin problems. Furthermore, many species, especially in the genera *Simulium*, transmit other filarial worms, protozoans or arboviruses to livestock, wild mammals and birds. Black fly attacks on humans, livestock and poultry can reduce productivity (Crosskey 1990; Adler et al., 2004). The immature stages develop in running water ecosystems where they often are a dominant component of the benthos. They have very important roles as prey and, through larval filter-feeding, in the removal of organic matter from the water column (Malmqvist et al., 2004). A total of 2,142 living, formally described species of black flies are currently recognized as valid, with new species continuing to be discovered at a rapid rate (Adler & Crosskey, 2014).

Turkish Simuliidae fauna is still not well known although the investigations have been much more increased in the last fifteen years. After the first report about the family in Anatolia made by Austen with describing *Simulium pulchripes* from Asiatic part of Çanakkale Province in 1925, the main researches contributed to the knowledge of Turkish black flies fauna can be classified as follow; Jedlicka (1975), Zwick (1978), Kazancı & Clergue-Gazeau (1990), Clergue-Gazeau & Kazancı (1992), Balık et al. (2002), Şirin & Şahin (2005), Crosskey & Zwick (2007), Kazancı & Ertunç (2008), Çağlar & İpekdal (2009), Kalafat & Şirin (2011) and Adler & Şirin (2014). As a result of them, the numbers of the Turkish black flies species are 52 according to the latest version of "Inventory of World Blackflies" published by Adler & Crosskey (2014), whereas about 650 species are known in Palearctic. Concerning with its biodiversity and zoogeographical status, it is expected that there are upwards of black flies species living in Turkey. This paper reports 17 blackflies species from East Marmara Region for the first time.

MATERIAL AND METHODS

The study material was based on mostly the aquatic stages collected from the 99 different lotic habitats which are rivers, streams and springs in the region and also on adults rearing from pupae. The material includes 2052 specimens (852 larvae, 953 pupae, 198 pharate adults and 49 reared adults) and was deposited in simuliid collection in Entomology Laboratory of Eskişehir Osmangazi University, Eskişehir.

Larvae and pupae were collected into and are preserved in 80% ethanol and reared flies with their pupal exuviae also were fixed in alcohol. For each species the number of larvae, pupae and adults obtained at a sampling site on a given date is recorded in the examined material list below. All examinations in conformity with methods described by Bass (1998) were made with the aid of a stereo microscope (Leica MZ 16).

Identifications were made using the keys and descriptions by Rubtsov (1956), Knoz (1965), Terteryan (1968), Crosskey (1991, 1998, 2002), Bass (1998), Crosskey & Malicky (2001), Yankovsky (2003) and Crosskey & Zwick (2007). In addition, papers by Jensen (1997), Crosskey & Crosskey (2000), Jedlicka & Stloukalova (1997) and Jedlicka et al. (2004), Belqat & Dakki (2004) were also used. The nomenclature used in this text follows Adler & Crosskey (2014), from which distribution data of the species is taken.

The positions of the collecting sites are shown on the map in Figure 1. Numbers on the map and in the following list provide correlation with the site records listed for each species in the text. All co-ordinates are given in east/north sequence.

Sampling sites

1. Bilecik Province, Osmaneli District, Selçik Village, *Sakarya River* [40° 22' N/ 29° 57' E 380 m].
2. Sakarya Province, Geyve District, Dereköy Village, *Sakarya River* [40° 35' N/ 30° 19' E 79 m].
3. Sakarya Province, Sapanca District, Akçay Village, *Akçay Stream* [40° 40' N/ 30° 19' E 109 m].
4. Sakarya Province, Sapanca District, Mahmudiye Village, *Mahmudiye Stream*. [40° 41' N/ 30° 14' E 99 m].
5. Sakarya Province, Sapanca District, Muradiye Village, *Muradiye Stream* [40° 40' N/ 30° 13' E 156 m].
6. Sakarya Province, Sapanca District, *Kurtköy Stream* [40° 41' N/ 30° 10' E 98 m].
7. Sakarya Province, Arifiye District, Fuadiye Village, *Fuadiye Stream* [40° 42' N/ 30° 25' E 54 m].
8. Sakarya Province, Erenler District, Kayalar Village, *Kayalar Stream* [40° 41' N/ 30° 27' E 64 m].
9. Sakarya Province, Akyazı District, Kepekli Village, *Kanlı Stream* [40° 40' N/ 30° 32' E 71 m].
10. Sakarya Province, Akyazı District, Harmanlı Village, *Uludere Stream* [40° 40' N/ 30° 34' E 67 m].
11. Sakarya Province, Akyazı District, *Mudurnu Brook* [40° 40' N/ 30° 37' E 82 m].
12. Sakarya Province, Akyazı District, Yağcılar Village, *Yağcılar Stream* [40° 40' N/ 30° 39' E 55 m].
13. Sakarya Province, Akyazı District, Altındere Town, *Akar Stream* [40° 40' N/ 30° 41' E 81 m].
14. Sakarya Province, Akyazı District, Altındere Town, *Bıkdere Stream* [40° 41' N/ 30° 42' E 53 m].
15. Sakarya Province, Hendek District, Çakallık Village, *Çakallık Stream* [40° 44' N/ 30° 43' E 74 m].
16. Sakarya Province, Hendek District, Sarıyer Village, *Sarıyer Stream* [40° 43' N/ 30° 43' E 70 m].
17. Sakarya Province, Hendek District, Kazımiye Village, *Kazımiye Stream* [40° 48' N/ 30° 41' E 116 m].
18. Sakarya Province, Hendek District, Sivritepe Village, *Hacıkişla Stream* [40° 51' N/ 30° 38' E 55 m].
19. Sakarya Province, Hendek District, *Dereköy Stream* [40° 56' N/ 30° 37' E 169 m].
20. Sakarya Province, Ferizli District, Aktefe Village, *Aktefe Stream* [40° 54' N/ 30° 36' E 42 m].
21. Sakarya Province, Kaynarca District, Sarıbeyli Village, *Sarıbeyli Stream* [40° 01' N/ 30° 20' E 52 m].
22. Kocaeli Province, Kandıra District, 5 km to Kandıra, *Duraçalı Stream* [41° 04' N/ 30° 10' E 58 m].
23. Kocaeli Province, Kandıra District, Kandıra-İzmit Road 3. km, *Kandıra Stream* [41° 03' N/ 30° 08' E 41 m].
24. Kocaeli Province, Kandıra District, Sofalı Village, *Safalı Stream* [41° 05' N/ 30° 05' E 26 m].
25. Kocaeli Province, Kandıra District, Akçaova Village, *Akçaova Stream* [41° 02' N/ 29° 56' E 93 m].
26. İstanbul Province, Ağva District, Çelebi Village, *Çelebi Stream* [41° 05' N/ 23° 59' E 40 m].
27. İstanbul Province, Ağva District, Bucaklı Village, *Yeşilçay Stream* [41° 07' N/ 29° 51' E 17m].

28. İstanbul Province, Şile District, Göce (Göksu) Village, *Göksu Kurudere Stream* [41° 06' N/ 29° 51' E 20m].
29. İstanbul Province, Ağva District, İsaköy Village, *Şelale -Göksu Stream* [41° 06' N/ 29° 48' E 23m].
30. İstanbul Province, Şile District, Yazımanayır Village, *Biçki Stream* [41° 04' N/ 29° 42' E 67m].
31. İstanbul Province, Şile District, Erenler Village, *Hacizli Stream* [41° 07' N/ 29° 33' E 38 m].
32. İstanbul Province, Sultanbeyli District, *Ömerli Stream* [40° 58' N/ 29° 19' E 91 m].
33. Kocaeli Province, Çayırova District, Sultanbeyli-Göçbeyli Road 6. km, *Göçbeyli Stream* [40° 56' N/ 29° 23' E 136 m].
34. Kocaeli Province, Çayırova District, Göçbeyli Village, *Göçbeyli Stream* [40° 58' N/ 29° 27' E 110 m].
35. Kocaeli Province, Gebze District, Mollafeneri Village, *Mollafeneri Stream* [40° 52' N/ 29° 28' E 128 m].
36. Kocaeli Province, Körfez District, Sevindikli Village, *Sevindikli Stream* [40° 53' N/ 29° 46' E 237 m].
37. Kocaeli Province, Gölcük District, Yazlık Location, *Yeniköy Stream* [40° 41' N/ 29° 52' E 78 m].
38. Kocaeli Province, Gölcük District, İhsaniye Village, *Şirinköy Stream* [40° 41' N/ 29° 49' E 59 m].
39. Kocaeli Province, Gölcük District, İhsaniye-Ümmiye Road 3 km, *Ümmiye Stream* [40° 40' N/ 29° 50' E 87 m].
40. Kocaeli Province, Gölcük District, Lütfiye Village, *Kavaklı Stream* [40° 39' N/ 29° 43' E 306 m].
41. Kocaeli Province, Karamürsel District, Avcıköy Village, *Avcıköy Stream* [40° 35' N/ 29° 43' E 140 m].
42. Kocaeli Province, Karamürsel District, Hürriyet Village, *Yaladere Stream* [40° 36' N/ 29° 33' E 139 m].
43. Yalova Province, Altınova District, Fevziye Village, *Fevziye Stream* [40° 36' N/ 29° 29' E 124 m].
44. Yalova Province, Altınova District, Fevziye Village, *Akar Stream* [40° 37' N/ 29° 27' E 122 m].
45. Yalova Province, Çiftlikköy District, Çukuyköy Village, *Çukurköy Stream* [40° 36' N/ 29° 25' E 165 m].
46. Yalova Province, Çiftlikköy, LaleköyVillage , *Laledere Stream* [40° 36' N/ 29° 23' E 99 m].
47. Yalova Province, Merkez District, Elmalık-Çiftlikköy Road 4 km, *Elmalık Stream* [40° 37' N/ 29° 18' E 89 m].
48. Yalova Province, Merkez District, Safran Village, *Safran Stream* [40° 36' N/ 29° 14' E 49 m].
49. Yalova Province, Merkez District, Soğucak Village, *Soğucak Stream* [40° 36' N/ 29° 16' E 90 m].
50. Yalova Province, Merkez District, Kadıköy Village, *Kadıköy Stream* [40° 37' N/ 29° 13' E 30 m].
51. Yalova Province, Çınarcık District, Çalca Village, *Çalca Stream* [40° 38' N/ 29° 10' E 36 m].
52. Yalova Province, Çınarcık District, Kocadere Village, *Kocadere Stream* [40° 37' N/ 29° 01' E 51 m].
53. Yalova Province, Armutlu District, Kaphıcalar Location, *Kaphıca Stream* [40° 32' N/ 28° 50' E 80 m].
54. Bursa Province, Gemlik District, Büyükkumla Town, *Akar Stream* [40° 28' N/ 29° 05' E 23 m].
55. Bursa Province, İznik District, Çakırca Village, *Karasu Stream* [40° 28' N/ 29° 40' E 105 m].
56. Kocaeli Province, Kartepe District, Yeşiltepe Village, *Uzuntarla Stream* [40° 43' N/ 30° 08' E 64 m].
57. İstanbul Province, Beykoz District, Çavuşbaşı Stream [41° 05' N/ 29° 08' E 103 m].
58. İstanbul Province, Beykoz District, Polonez Village, *Polonezköy Stream* [41° 06' N/ 29° 10' E 121 m].
59. İstanbul Province, Beykoz District, Cumhuriyet Village, *Cumhuriyet Stream* [41° 07' N/ 29° 14' E 121 m].
60. İstanbul Province, Çekmeköy District, Hüseyinli Village, *Hüseyinli Stream* [41° 06' N/ 29° 18' E 37 m].
61. İstanbul Province, Şile District, Ovacak Village, *Ovacık Stream* [41° 07' N/ 29° 28' E 48 m].
62. İstanbul Province, Şile District, Yeniköy Village, *Yeniköy Stream* [41° 07' N/ 29° 29' E 68 m].
63. İstanbul Province, Ağva District, YağcılarVillage, *Yağcılar Stream* [41° 05' N/ 29° 52' E 31 m].
64. İstanbul Province, Ağva District, Küçükklü Village, *Küçükklü Stream* [41° 04' N/ 29° 55' E 48 m].
65. Kocaeli Province, Kandıra District, Akçaova Village, *Koca Stream*, [41° 01' N/ 29° 57' E 216 m].
66. Kocaeli Province, Kandıra District, Hediyeeli Village, *Hediyeeli Stream* [41° 03' N/ 30° 02' E 62 m].
67. Kocaeli Province, Kandıra District, Ferizli Village, *Ferizli Stream*, [41° 00' N/ 30° 11' E 73 m].
68. Kocaeli Province, Kandıra District, Kanatlar Village, *Karaağaç Stream* [41° 00' N/ 30° 14' E 77 m].
69. Sakarya Province, Kaynarca District, Yeniçam Village, *Çoban Stream* [40° 59' N/ 30° 15' E 104 m].
70. Sakarya Province, Kaynarca District, Salmanlı Village, *Akmeşe Stream* [40° 53' N/ 30° 18' E 100 m].
71. Sakarya Province, Söğütülü Distric, Akgöl Village, *Akgöl Stream* [40° 52' N/ 30° 26' E 28 m].
72. Sakarya Province, Hendek Distric, Aşağı Çalca Village, *Aşağı Çalık Stream* [40° 49' N/ 30° 38' E 41 m].
73. Sakarya Province, Hendek Distric, Hacıkışla Village, *Hacıkışla Stream* [40° 51' N/ 30° 38' E 64 m].
74. Sakarya Province, Hendek District, Soğuksu Village, *Soğuksu Stream* [40° 53' N/ 30° 37' E 63 m].
75. Sakarya Province, Karasu District, Darıçayırnı Village, *Karasu Stream* [41° 01' N/ 30° 38' E 28 m].
76. Kocaeli Province, Kartepe District, Yanıkköy Stream [40° 41' N/ 30° 09' E 109 m].
77. Kocaeli Province, Kartepe District, Aşağı Eşme Village, *Eşme Stream* [40° 44' N/ 30° 13' E 58 m].
78. Kocaeli Province, Kartepe District, KetencilerVillage, *Ketenciler Stream* [40° 45' N/ 30° 08' E 56 m].
79. Kocaeli Province, İzmit District, Sepetçi Village, *Biçkadere Stream* [40° 48' N/ 29° 59' E 58 m].

80. Kocaeli Province, İzmit District, Sepetçi Village, *Bıçkıdere 2 Stream* [40° 49' N/ 29° 59' E 60 m].
 81. Kocaeli Province, İzmit District, Emirhan Village, *Emirhanlar Stream* [40° 48' N/ 30° 03' E 79 m].
 82. Kocaeli Province, Derince District, Kayalar Village, *Kayalar Stream* [40° 52' N/ 29° 51' E 231 m].
 83. İstanbul Province, Şile District, Yaka Village, *Meşeli Stream* [40° 59' N/ 29° 39' E 121 m].
 84. Kocaeli Province, Gebze District, Ballıkaya Canyon, *Ballıkaya Stream* [40° 50' N/ 29° 30' E 50 m].
 85. Yalova Province, Çiftlikköy District, Gacık Village, *Gacık Stream* [40° 36' N/ 29° 19' E 113 m].
 86. Yalova Province, Armutlu District, Hayriye Village, *Hayriye Stream* [40° 30' N/ 28° 58' E 413 m].
 87. Yalova Province, Armutlu District, Fıstıklı Village, *Fıstıklı Stream* [40° 29' N/ 28° 53' E 15 m].
 88. Yalova Province, Armutlu District, *Çaldere Stream* [40° 34' N/ 28° 54' E 38 m].
 89. Yalova Province, Çınarcık District, Esenköy Village, *Esenköy Stream* [40° 36' N/ 28° 56' E 19 m].
 90. Yalova Province, Çınarcık District, Teşvikiye Village, *Karpuz Stream* [40° 38' N/ 29° 04' E 4 m].
 91. Kocaeli Province, Başiskele District, Kullar Village, *Kullar Stream* [40° 43' N/ 29° 59' E 45 m].
 92. Bilecik Province, Osmaneli District, Oğulpaşa Village, *Yeşilçimen Stream* [40° 26' N/ 29° 54' E 395 m].
 93. Bursa Province, İznik District, Çamdibi Village, *Kaynarca Stream* [40° 24' N/ 29° 43' E 170 m].
 94. Bursa Province, İznik District, Boyalıca Village, *Kurudere Stream* [40° 29' N/ 29° 35' E 98 m].
 95. Yalova Province, Altınova District, Örencik Village, *Keramet Stream* [40° 36' N/ 29° 27' E 150 m].
 96. Bursa Province, İznik District, Gürmüzlü Village, *Gürmüzlü Stream* [40° 30' N/ 29° 46' E 513 m].
 97. Sakarya Province, Geyve District, Bağlarbaşı Village, *Sakarya River* [40° 33' N/ 30° 20' E 310 m].
 98. Sakarya Province, Geyve District, Koruköy Village, *Koru Stream* [40° 31' N/ 30° 26' E 742 m].
 99. Sakarya Province, Taraklı District, Çayköy Village, *Çayköy Stream* [40° 27' N/ 30° 27' E 537 m].

RESULTS

A total of 17 species belonging to 5 different subgenus (*Wilhelmia*, *Nevermannia*, *Eusimulium*, *Boophthora*, *Simulium*) were determined from study sites. The list of species, collecting sites and dates, Turkey and World distribution are given at below.

Simulium (Boophthora) erythrocephalum (De Geer, 1776)

Material examined: Site 8- 1 ♂ pharate adult, 7 pupae, 4 larvae, 24.v.2002; 24.st- 4 pupae, 5 larvae, 16.vi.2002.

Distribution in World: Armenia, Austria, Belarus, Belgium, Britain, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Siberia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Mongolia (Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes River Basin, Sakarya Nehir Sistemi (Kazancı & Ertunç, 2008).

Simulium (Eusimulium) petricolum (Rivosecchi, 1963)

Material examined: Site 10- 1 ♂ pharate adult, 6 pupae, 6 larvae, 16.vi.2002; Site 17- 2 ♂♂ pharate adult, 8 pupae, 11 larvae, 17.vi.2002; Site 19- 2 ♂♂ pharate adult, 9 pupae, 10 larvae, 14.ix.2001; Site 20- 1 ♂ pharate adult, 5 pupae, 8 larvae, 17.vi.2002; Site 75- 2 ♂♂ pharate adult, 1 ♀ pharate adult, 3 pupae, 14 larvae, 17.vi.2002; Site 76- 4 ♂♂ pharate adult, 7 pupae, 3 larvae, 19.vi.2002; Site 79- 1 ♂ pharate adult, 2 pupae, 19.vi.2002; Site 92- 1 ♂ pharate adult, 1 pupae, 18.v.2003; Site 96- 1 ♂ pharate adult, 4 pupae, 4 larvae, 19.v.2003.

Distribution in World: Algeria, Austria, Bosnia, Britain, Cyprus, Czech Republic, France, Greece/Ireland, Italy, Libya, Madeira, Morocco, Portugal, Serbia, Spain, Turkey, Russia (Adler & Crosskey, 2014).

Distribution in Turkey: Afyon (Kalafat and Şirin, 2011)

Simulium (Eusimulium) velutinum (Santos Abreu, 1922)

Material examined: Site 41- 2 ♂♂ pharate adult, 2 ♀♀ pharate adult, 6 pupae, 6 larvae, 16.ix.2001; Site 42- 1 ♂ pharate adult, 2 ♀♀ pharate adult, 5 pupae, 22.vi.2002; Site 43- 1 ♂ pharate adult, 1 ♀ pharate adult, 4 pupae, 8 larvae, 22.vi.2002; Site 84.st- 1 ♂, 3 ♂♂ pharate adult, 1 ♀ pharate adult, 8 pupae, 10 larvae, 20.vi.2002; Site 90- 2 ♂♂ pharate adult, 1 ♀

pharate adult, 7 pupae, 5 larvae, 22.vi.2002; Site 91- 1 ♂ pharate adult, 3 ♀♀ pharate adult, 3 pupae, 7 larvae, 22.vi.2002.

Distribution in World: Canary Islands (La Palma, Gomera); Algeria, Andorra, Balearic Islands (Majorca, Minorca), Bosnia, Britain (En, Sc, Wa), Cyprus, Czech Republic, Finland, France (incl. Corsica), Germany, Greece (incl. Corfu, Crete, Lésbos, Páros, Rhodes), Hungary, Ireland, Israel, Italy (incl. Sardinia, Sicily), Jordan, Libya, Macedonia, Majorca, Malta, Morocco, Norway, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Tunisia, Turkey, Ukraine (Crosskey & Howard, 1996; Zwick, 1978; Kazancı & Ertunç, 2008; Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes Riever Basin, Namnam Stream (Kazancı & Ertunç, 2008).

Simulium (Nevermannia) angustitarse (Lundström, 1911)

Material examined: Site 24- 3 pupae, 8 larvae, 14.ix.2001; Site 37- 6 pupae, 9 larvae, 23.vi.2002; Site 57- 7 pupae, 4 larvae, 12.vi.2002.

Distribution in World: Finland; Algeria, Austria, Belarus, Bosnia, Britain, China, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Ireland, Italy, Kyrgyzstan, Latvia, Letonia, Lithuania, Luxembourg, Macedonia, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Siberia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine (Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes River Basin, Sakarya River Basin (Kazancı & Ertunç, 2008).

Simulium (Nevermannia) cryophilum (Rubtsov, 1959)

Material examined: Site 13- 8 pupae, 7 larvae, 16.vi.2002; Site 46- 6 pupae, 4 larvae, 20.vi.2002; Site 49- 5 pupae, 7 larvae, 21.vi.2002; Site 85- 1 ♀, 4 pupae, 6 larvae, 21.vi.2002; Site 86- 1 ♂, 1 ♀, 7 pupae, 5 larvae, 21.vi.2002; Site 89- 6 pupae, 7 larvae, 22.vi.2002; Site 92- 1 pupae, 2 larvae, 18.v.2003; Site 95- 9 pupae, 19.v.2003.

Distribution in World: Algeria, Andorra, Armenia, Austria, Balearic Islands (Majorca), Belgium, Bosnia, Britain, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lebanon, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Russia, Scotland, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, Ukraine (Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes River Basin, Esen River Basin (Kazancı & Ertunç, 2008).

Simulium (Nevermannia) lundstromi (Enderlein, 1921)

Material examined: Site 12- 5 pupae, 14 larvae, 14.vi.2002; Site 16- 7 pupae, 6 larvae, 16.vi.2002.

Distribution in World: Britain; Algeria, Austria, Belarus, Belgium, Bulgaria, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lebanon, Lithuania, Morocco, Netherlands, Norway, Poland, Portugal, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine (Adler & Crosskey, 2014).

Distribution in Turkey: Sakarya River Basin, Zamanti River Basin (Kazancı & Ertunç, 2008).

Simulium (Simulium) noelleri Friederichs, 1920

Material examined: Site 29- 11 pupae, 12 larvae, 13.vi.2002; Site 31.st- 1 ♂ pharate adult, 7 pupae, 10 larvae, 15.ix.2001.

Distribution in World: Armenia, Austria, Belarus, Belgium, Bosnia, Britain, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Serbia, Siberia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, Ukraine, USA (Alaska) (Adler & Crosskey, 2014).

Distribution in Turkey: Sakarya River Basin (Kazancı & Ertunç, 2008).

Simulium (Simulium) variegatum Meigen, 1818**Material examined:** Site 76- 5 pupae, 4 larvae, 19.vi.2002.**Distribution in World:** Algeria, Andorra, Armenia, Austria, Azerbaijan, Belgium, Bosnia, Britain, Bulgaria, China, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, Iran, Ireland, Italy, Kazakhstan, Lebanon, Morocco, Pakistan, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Uzbekistan (Adler & Crosskey, 2014).**Distribution in Turkey:** Altındere Stream (in Trabzon), Ceyhan River Basin, Çoruh River Basin, Dicle River Basin, Fırat River Basin, Fırtına Stream, Köyceğiz Protected Area, Sakarya River Basin, Salda Lake Basin, Zap River (Kazancı & Ertunç, 2008).***Simulium (Simulium) bezzii (Corti, 1914)*****Material examined:** Site 95- 3 pupae, 19.v.2003; Site 96- 7 pupae, 1 larvae, 19.v.2003.**Distribution in World:** Algeria, Andorra, Armenia, Austria, Azerbaijan, Bosnia, Bulgaria, Cyprus, France, Georgia, Germany, Greece, Iran, Iraq, Israel, Italy, Lebanon, Macedonia, Morocco, Poland, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, Uzbekistan (Adler & Crosskey, 2014).**Distribution in Turkey:** Ceyhan River Basin, Çoruh River Basin, Göksu River Basin, Fırat River Basin, Kızılırmak River Basin Sakarya River Basin, Streams in Eastern Blacksea Region, Yuvarlakçay Stream, Yeşilirmak Stream (Kazancı & Ertunç, 2008).***Simulium (Simulium) reptans (Linnaeus, 1758)*****Material examined:** Site 28- 4 pupae, 7 larvae, 14.vi.2002; Site 29- 8 pupae, 3 larvae, 15.ix.2001.**Distribution in World:** Austria, Belarus, Belgium, Bosnia, Britain, Bulgaria, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Siberia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, Uzbekistan (Adler & Crosskey, 2014).**Distribution in Turkey:** Büyük Menderes Nehir Sistemi (Kazancı & Ertunç, 2008).***Simulium (Simulium) kerisorum (Rubtsov, 1956)*****Material examined:** Site 71- 3 pupae, 15.vi.2002.**Distribution in World:** Azerbaijan, Bulgaria, Kyrgyzstan, Turkey (Adler & Crosskey, 2014).**Distribution in Turkey:** Sakarya River Basin, Fırat River Basin (Kazancı & Ertunç, 2008).***Simulium (Simulium) argyreatum Meigen, 1838*****Material examined:** Site 13- 8 pupae, 7 larvae, 16.vi.2002; Site 62- 7 pupae, 2 larvae, 13.vi.2002; Site 98- 2 pupae, 2 larvae, 20.vi.2003; Site 99- 2 pupae, 4 larvae, 20.vi.2003.**Distribution in World:** Andorra, Austria, Belgium, Bosnia, Britain, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Ireland, Italy, Luxembourg, Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Kazakhstan (Adler & Crosskey, 2014).**Distribution in Turkey:** Sakarya River Basin (Kazancı & Ertunç, 2008).***Simulium (Simulium) kiritshenkoi Rubtsov, 1940.*****Material examined** 4. st.- 7 pupae, 6 larvae (11.ix.2001, 19.vi.2002); 13. st.- 8 pupae (12.ix.2001, 16.vi.2002); 14. st.- 13 pupae, 11 larvae, (12.ix.2001, 16.vi.2002); 30. st.- 10 pupae, 9 larvae, (15.ix.2001, 14.vi.2002); 33. st.- 7 pupae, 12 larvae, (15.ix.2001); 38. st.- 6 pupae, 10 larvae, (16.ix.2001); 55. st.- 4 pupae, 7 larvae, (17.ix.2001); 57. st.- 6 pupae, 7 larvae (12.vi.2002); 58. st.- 4 pupae, 8 larvae (12.vi.2002); 59. st.- 5 pupae, 10 larvae (13.vi.2002); 60. st.- 6 pupae, 8 larvae (13.vi.2002); 64. st.- 5 pupae, 6 larvae (14.vi.2002); 66. st.- 8 pupae, 3 larvae (14.vi.2002); 67. st.-1 ♂, 3 pupae, 3 larvae (15.vi.2002); 68. st.- 7 pupae, 4 larvae (15.vi.2002); 77. st.- 6 pupae, 2 larvae (19.vi.2002); 81. st.- 1 ♂, 1 ♀, 5 pupae, 9 larvae (19.vi.2002).

Distribution in World: Iran; Armenia, Azerbaijan, Bulgaria, Cyprus, Iraq, Pakistan, Romania, Russia, Tajikistan Turkey, Ukraine (Adler & Crosskey, 2014).

Distribution in Turkey: Ceyhan River Basin, Fırat River Basin, Kızılırmak River Basin, Sakarya River Basin, Yeşilirmak River Basin, Zamantı River Basin (Kazancı & Ertunç, 2008).

Simulium (Wilhelmia) lineatum (Meigen, 1804)

Material examined: Site 71- 8 pupae, 14 larvae, 15.vi.2002.

Distribution in World: Germany; Afghanistan, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia, Britain (En, Wa), Bulgaria, China, Czech Republic, Denmark, France (incl. Corsica), Greece, Hungary, Iran, Iraq, Ireland, Italy (incl. Sardinia, Sicily), Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Lithuania, Netherlands, Pakistan, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan (Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes River Basin, Çoruh River Basin, Kızılırmak River Basin, Sakarya River Basin, Yeşilirmak River Basin, Köyceğiz Protected Area (Muğla), Esen River Basin (Kazancı & Ertunç, 2008).

Simulium (Wilhelmia) balcanicum (Enderlein, 1924)

Material examined: Site 2- 6 pupae, 12 larvae, 11.ix.2001; Site 3- 8 pupae, 10 larvae, 18.vi.2002; Site 6- 5 pupae, 11.ix.2001; Site 8- 4 pupae, 2 larva, 16.vi.2002; Site 9- 1 ♂, 1 ♀, 1 ♂ pharate adult, 3 pupae, 5 larvae, 16.vi.2002; Site 10- 9 pupae, 3 larvae, 16.vi.2002; Site 15- 2 ♀♀ pharate adult, 7 pupae, 2 larvae, 16.vi.2002; Site 28- 6 pupae, 12 larvae, 14.vi.2002; Site 70- 1 ♂, 11 pupae, 15 larvae, 15.vi.2002; Site 75- 13 pupae, 5 larvae, 17.vi.2002; Site 78- 1 ♂ pharate adult, 5 pupae, 6 larvae, 19.vi.2002.

Distribution in World: Austria, Bulgaria, Belarus, Bosnia, Germany, Greece, Hungary, Italy, Lithuania, Macedonia, Poland, Romania, Russia Serbia, Slovakia, Slovenia, Turkey, Ukraine (Adler & Crosskey, 2014).

Distribution in Turkey: Büyük Menderes River Basin, Esen Çayı Sistemi, Kızılırmak River Basin, Sakarya River Basin, Yeşilirmak River Basin (Kazancı & Ertunç, 2008).

Simulium (Wilhelmia) paraequinum Puri, 1933

Material examined: Site 28- 2 ♂♂ pharate adult, 1 ♀ pharate adult, 8 pupae, 14 larvae, 14.vi.2002; Site 29- 2 ♂♂ pharate adult, 6 pupae, 4 larvae, 15.ix.2001; Site 48- 3 ♂♂ pharate adult, 2 ♀♀ pharate adult, 7 pupae, 6 larvae, 21.vi.2002.

Distribution in World : Pakistan; Armenia, Azerbaijan, Bulgaria, Greece Hungary, Iran, Iraq, Israel, Italy, Jordan, Lebanon, Romania, Serbia, Turkey, Ukraine (Crimea) (Adler & Crosskey, 2014).

Distribution in Turkey: Ceyhan River Basin, Büyük Menderes River Basin, Esen River Basin, Sakarya River Basin, Western Mediterranean Streams, Zamantı River (Kazancı & Ertunç, 2008).

Simulium (Wilhelmia) pseudequinum Seguy, 1921

Material examined: Site 1- 1 ♂ pharate adult; 4 pupae, 12 larvae, 10.ix.2001; Site 3- 2 ♂♂ pharate adult; 11 pupae, 18 larvae, 18.vi.2002; Site 5- 4 ♂♂ pharate adult; 2 ♀♀ pharate adult; 15 pupae, 8 larvae 11.ix.2001; Site 6- 1 ♂ pharate adult; 7 pupae, 3 larvae, 11.ix.2001; Site 7- 1 ♂ pharate adult; 8 pupae, 15 larvae, 16.vi.2002; Site 8- 3 ♂♂ pharate adult, 2 ♀♀ pharate adult, 14 pupae, 22 larvae, 16.vi.2002; Site 9- 5 ♂♂, 6 ♀♀, 1 ♂ pharate adult; 9 pupae, 5 larvae, 16.vi.2002; Site 10- 1 ♂, 1 ♀, 1 ♂ pharate adult; 1 ♀ pharate adult, 11 pupae, 10 larvae, 16.vi.2002; Site 11- 1 ♂ pharate adult, 3 pupae, 12.ix.2001; Site 12- 2 ♂♂ pharate adult; 7 pupae, 13 larvae, 16.vi.2002; Site 13- 1 ♂ pharate adult; 8 pupae, 16.vi.2002; Site 14- 2 ♀♀ pharate adult; 13 pupae, 11 larvae, 16.vi.2002; Site 15- 3 ♂♂ pharate adult; 9 pupae, 12 larvae, 13.ix.2001; Site 16- 2 ♂♂, 1 ♀, 2 ♂♂ pharate adult; 5 pupae, 7 larvae, 16.vi.2002; Site 17- 1 ♂, 1 ♀, 2 ♂♂ pharate adult; 18 pupae, 9 larvae, 17.vi.2002; Site 18- 2 ♂♂ pharate adult; 3 ♀♀ pharate adult, 12 pupae, 7 larvae, 13.ix.2001; Site 19- 2 ♂♂ pharate adult; 4 pupae, 12 larvae, 14.ix.2001; Site 20- 1 ♂, 2 ♀♀, 3 ♂♂ pharate adult; 18 pupae, 5 larvae, 17.vi.2002; Site 21- 1 ♂ pharate adult; 3 pupae, 14.ix.2001; Site 22- 5 pupae, 14.ix.2001; Site 23- 1 ♂ pharate adult; 14.ix.2001; Site 25- 1 ♂ pharate adult; 8 pupae, 15 larvae, 16.vi.2002;

Site 30- 3 ♂♂ pharate adult; 12 pupae, 13 larvae, 14.vi.200; Site 31- 1 ♂, 1 ♀, 1 ♂ pharate adult; 7 pupae, 15 larvae, 15.ix.2001; Site 32- 11 pupae, 15.ix.2001; Site 33- 2 ♂♂ pharate adult; 4 pupae, 13 larvae, 15.ix.2001; Site 34- 4 ♂♂ pharate adult; 8 pupae, 13 larvae, 15.ix.2001; Site 35- 3 ♂♂ pharate adult; 12 pupae, 9 larvae, 15.ix.2001; Site 36- 4 ♂♂ pharate adult; 9 pupae, 11 larvae, 20.vi.2002; Site 38- 1 ♂ pharate adult, 2 ♀♀, 9 pupae, 13 larvae, 16.ix.2001; Site 39- 2 ♂♂ pharate adult; 12 pupae, 3 larvae, 16.ix.2001; Site 40- 12 pupae, 8 larvae, 16.ix.2001; 42. st.- 2 ♂♂ pharate adult, 2 ♀♀ pharate adult, 7 pupae, 15 larvae, 22.vi.2002; Site 43- 5 ♂♂ pharate adult, 9 pupae, 17 larvae, 22.vi.2002; Site 44- 2 ♂♂ pharate adult, 2 pharate adult ♀♀, 7 pupae, 15 larvae, 22.vi.2002; Site 45- 3 ♂♂ pharate adult, 1 pharate adult ♀, 7 pupae, 22.vi.2002; Site 46- 1 ♂ pharate adult, 6 pupae, 20.vi.2002; Site 47- 1 ♂ pharate adult, 1 ♀ pharate adult, 11 pupae, 12 larvae, 16.ix.2001; Site 48- 3 ♂♂ pharate adult, 12 pupae, 4 larvae, (16.ix.2001, 21.vi.2002); Site 49- 2 ♂♂ pharate adult, 4 pupae, 18 larvae, 21.vi.2002; Site 50- 2 ♀♀ pharate adult, 6 pupae, 5 larvae, 17.ix.2001; Site 51- 2 ♂♂ pharate adult, 1 ♀ pharate adult, 3 pupae, 17.ix.2001; Site 52- 2 ♂♂ pharate adult, 3 ♀♀ pharate adult, 7 pupae, 22.vi.2002; Site 53- 1 ♂ pharate adult, 8 pupae, 13 larvae 17.ix.2001; Site 54- 4 ♂♂ pharate adults, 9 pupae, 11 larvae, 21.vi.2002; Site 55- 1 ♂ pharate adult, 4 pupae, 2 larvae, 17.ix.2001; Site 56- 3 ♂♂ pharate adult, 2 ♀♀ pharate adult, 11 pupae, 10 larvae, 19.vi.2002; Site 61- 1 ♂ pharate adult, 4 pupae, 11 larvae, 13.vi.2002; Site 63- 1 ♂, 2 ♂♂ pharate adult, 7 pupae, 13 larvae, 14.vi.2002; Site 65- 1 ♂, 1 ♀, 1 ♂ pharate adult, 6 pupae, 14 larvae, 14.vi.2002; Site 69- 1 ♂ pharate adult, 4 pupae, 15.vi.2002; Site 70- 1 ♂ pharate adult, 1 ♀ pharate adult, 6 pupae, 8 larvae, 15.vi.2002; Site 72- 1 ♂, 2 ♂♂ pharate adult, 8 pupae, 3 larvae, 17.vi.2002; Site 73- 1 ♂, 3 ♂♂ pharate adult, 1 ♀ pharate adult, 5 pupae, 9 larvae, 17.vi.2002; Site 74- 2 ♂♂ pharate adult, 6 pupae, 7 larvae, 17.vi.2002; Site 75- 1 ♂ pharate adult, 1 ♀ pharate adult, 3 pupae, 17.vi.2002; Site 77- 2 ♂♂, 1 ♂ pharate adult, 8 pupae, 12 larvae, 19.vi.2002; Site 78- 3 ♀♀, 1 ♂ pharate adult, 6 pupae, 19.vi.2002; Site 80- 1 ♂ pharate adult, 1 ♀ pharate adult, 5 pupae, 9 larvae, 19.vi.2002; Site 82.- 2 ♂♂, 1 ♂ pharate adult, 3 pupae, 19.vi.2002; Site 83- 1 ♂ pharate adult, 6 pupae, 4 larvae, 20.vi.2002; Site 84- 1 ♂, 1 ♀, 1 ♂ pharate adult, 1 ♀ pharate adult, 3 pupae, 20.vi.2002; Site 87- 1 ♂ pharate adult, 6 pupae, 21.vi.2002; Site 88- 2 ♂♂ pharate adult, 6 pupae, 13 larvae, 22.vi.2002; Site 90- 3 ♂♂ pharate adult, 3 pupae, 22.vi.2002; Site 93- 1 ♂ pharate adult, 1 pupae, 18.v.2003; Site 94- 1 ♂ pharate adult, 10 pupae, 19.v.2003; Site 97- 2 ♂♂ pharate adult, 2 pupae, 3 larvae, 20.v.2003.

Distribution in World: Canary Islands (Gran Canaria, Gomera, Tenerife); Algeria, Armenia, Austria, Azerbaijan, Bosnia, Britain (En), China (Sx, Xi), Cyprus, France, Greece (incl. Andros, Chios, Crete, Ikaría, Lésbos, Nákos, Georgia, India (Kashmir, Pu), Iran, Iraq, Israel, Italy (incl. Sardinia, Sicily), Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Libya, Macedonia, Morocco, Pakistan, Portugal, Romania, Russia (Caucasus), Serbia, Slovakia, Slovenia, Spain, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine (incl. Crimea), Uzbekistan, Czech Republic (Adler & Crosskey, 2014).

Distribution in Turkey: Altundere Stream (In Trabzon province Maçka), Büyük Menderes River Basin, Çoruh River Basin, Esen River Basin, Fırat River Basin, Kızılırmak River Basin, Köyceğiz Protected Area, Namnam Stream, Sakarya River Basin, Seyhan River Basin, Yeşilirmak River Basin, Tarsus River, Zamantı River (Kazancı & Ertunç, 2008).

ACKNOWLEDGEMENTS

We are thankful to Dr. Peter H. Adler (Clemson University, USA) for confirming some species. This study was supported by the Scientific and Technical Research Council of Turkey (101T061 TBAG-2050).

LITERATURE CITED

Adler, P. H. & Crosskey, R. W. 2014. World blackflies (Diptera: Simuliidae): a comprehensive revision of the taxonomic and geographical inventory. <http://www.clemson.edu/cafls/departments/esps/-biomia/pdfs/blackflyinventory.pdf> [Cited 26 January 2014]

Adler, P. H. & Şirin, Ü. 2014. Cytotaxonomy of the *Prosimulium* (Diptera: Simuliidae) of Western Asia. *Zool. J. of the Linn. Soc.*, (in press).

- Adler, P. H., Currie, D. C. & Wood, D. M.** 2004. The black flies (Simuliidae) of North America. Ithaca, NY.
- Balik, S., Ustaoglu, M. R., Özbek, M., Taşdemir, A. & Topkara, E. T.** 2002. A preliminary study on the aquatic fauna of Yelköprü Cave (Dikili, İzmir) and its vicinity. E.U. Jour. of Fish. and Aqua. Sci., 19: 210-225.
- Bass, J.** 1998. Last-instar larvae and pupae of the Simuliidae of Britain and Ireland. Cumbria: U.K.
- Belqat, B. & Dakki, M.** 2004. Clés Analytiques des Simulies (Diptera) du Maroc [Identification keys of the black-flies (Diptera: Simuliidae) of Morocco]. Zool. Baetica, 15: 77-137.
- Clergue-Gazeau, M. & Kazancı, N.** 1992. Simuliidae (Insecta: Diptera) of Turkey 2: Ecological approach to the principal species collected in several hydrographic networks. Hacet. Üniv. Fen ve Müh. Bil. Der., 13: 17-32.
- Crosskey, R. W.** 1990. The Natural History of Black flies. – Chichester, 711 pp.
- Crosskey, R. W.** 1998. Records of blackflies from mainland Greece (Diptera: Simuliidae). Entomologist's Gazette, 49: 277-283.
- Crosskey, R. W.** 2002. A taxonomic account of the blackfly fauna of Iraq and Iran, including keys for species identification (Diptera: Simuliidae). Journal of Natural History. 36: 1841-1886.
- Crosskey, R. W. & Crosskey, M. E.** 2000. An investigation of the blackfly fauna of Andalusia, southern Spain (Diptera: Simuliidae). J. Nat. Hist., 34: 895-951.
- Crosskey, R. W. & Malicky, H.** 2001. A first account of the black flies (Diptera, Simuliidae) of the Greek Islands. Studia Dipterologica. 8: 111-141.
- Crosskey, R. W. & Zwick, H.** 2007. New faunal records, with taxonomic annotations, for the blackflies of Turkey (Diptera, Simuliidae). Aquatic Insects. 29: 21-48.
- Çağlar, S. S. & İpekdağ, K.** 2009. A biogeographical evaluation of the Turkish Simuliidae fauna. Acta Zoologica Lituana. 19: 148-151.
- Jedlicka, L.** 1975. *Odagmia ornata caucasica* Rubtsov, 1940 (Diptera, Simuliidae) in Turkey. Acta Rerum Naturalium Musei Nationalis Slovaciae, 21: 255-258.
- Jedlicka, L., Kudela, M. & Stloukalova, V.** 2004. Key to the identification of blackfly pupae (Diptera: Simuliidae) of Central Europe. Biologia, Bratislava, 15: 157-178.
- Jedlicka, L. & Stloukalova, V.** 1997. Family: Simuliidae. Contributions to a Manual of Palearctic Diptera. Budapest: Hungary. part of Nematocera and Lower Brachycera, 2: 331-347.
- Jensen, F.** 1997. Aquatic Insects of North Europe - A Taxonomic Handbook 2. Diptera: Simuliidae, Black flies. p. 209-241.
- Kalafat, A. & Şirin, U.** 2011. A New Record for Turkish Blackfly Fauna: *Simulium (Eusimulium) petricolum* (Rivosecchi, 1963) (Diptera, Simuliidae). J. Entomol. Res. Soc., 13 (1): 49-52.
- Kazancı, N. & Clergue-Gazeau, M.** 1990. Simuliidae de Turquie. I. Premie`res donne`es faunistiques et bioge`ographiques (Diptera, Simuliidae). Annales de Limnologie, 26: 45-50.
- Kazancı, N. & Ertunç, Ö.** 2008. Checklist of the Simuliidae (Insecta, Diptera) of Turkey. Review of Hidrobiologia, 2: 129-144.
- Knoz, J.** 1965. To identification of Czechoslovakian black-flies (Diptera, Simuliidae). Folia Pírodovdecké Fakulty University J. E., 6 (5): 1-142.
- Malmqvist, B., Adler, P. H., Kuusela, K., Merritt, R. W. & Wotton, R. S.** 2004. Black flies in the boreal biome, key organisms in both terrestrial and aquatic environments: a review. Écoscience. 11: 187-200.
- Rubtsov, I. A.** 1956. Blackflies (fam. Simuliidae) [Moshki (sem. Simuliidae)]. Fauna of the USSR, New Series No. 64, Insects, Diptera [Fauna SSSR Novaya seriya No. 64, Nasekomye dvukrylye] 6 (6). Moscow:

Leningrad. Akademii Nauk SSSR. [In Russian: English translations 'Blackflies (Simuliidae) Second Edition New Delhi, 1989 and E.J. Brill, Leiden, 1990].

Sirin, U. & Sahin, Y. 2005. New records of black flies (Diptera, Simuliidae) for the Turkish fauna. *Zoology in the Middle East*, 36: 87-98.

Terteryan, A. E. 1968. Blackflies (Simuliidae): Fauna of the Armenian SSR, Diptera [Moshki (Simuliidae) Fauna Armyanskoi SSR, Nasekomye dvukrylye]. Yerevan: SSR.

Yankovsky, A. V. 2003 [2002]. A key for the identification of blackflies (Diptera: Simuliidae) of Russia and adjacent countries (former USSR) [Opredelitel' moshek (Diptera: Simuliidae) Rossii i soprodel'nykh territoriy (byvshego SSSR)]. Saint Petersburg. [Title page dated 2002 but book not published until April 2003 (information in litt. A.V.Y. to R.W.C. 3.iii.2004.).]

Zwick, H. 1978. Simuliidae. In: Illies J, editor. *Limnofauna Europaea: Eine Zusammenstellung aller die europaischen Binnengewassers bewohnenden mehrzelligen Tierarten mit Angaben u"ber ihre Verbreitung und Okologie*, 2nd ed. Stuttgart: New York: Fischer and Amsterdam. Pp. 396-403.

Zwick, H. 2007. On a small collection of wild-caught adult blackflies (Dipt., Simuliidae) from Turkey. *Entomologist's Monthly Magazine*, 143: 100.



Figure 1. Map of collecting sites in East Marmara Region.