



Areographical Structure of the Tachinid Fauna (Diptera: Tachinidae) from the Mediterranean Africa

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Abstract: Currently, 260 species of the family Tachinidae, belonging to 122 genera and four subfamilies, have been recorded from the Mediterranean Africa. Their distribution is analysed and an areographical characteristic of the species is presented. A total of 31 species is known only from the Mediterranean Africa, while 229 species have been found also beyond it. The tachinids belong to 61 zoogeographical categories, divided into two main groups: 1) species with Mediterranean type of distribution (140 species – 53.8%) – more thermophilic and distributed mainly in the southern parts of the Palaearctic. The species of the southern type, distributed in the Palaearctic and beyond it, can be formally related to this group as well; 2) species with Holarctic and Palaearctic type of distribution (120 species – 46.2%) – more cold-resistant and widely distributed in the Palaearctic. The species of the northern type, distributed in the Palaearctic and beyond it, can be formally related to this group as well. The zoogeographical character of the fauna of Tachinidae is determined by the first group (inversely to the European). The limiting role of the deserts in the migration of tropical forms to the north is conspicuous.

Key words: Diptera, Tachinidae, African Mediterranean Subregion, faunistic composition, zoogeography

Introduction

The African border between the Palaearctic and the Afrotropical Regions is not clear. Most zoogeographers draw this line along the southern end of Sahara (GEPTNER 1936, PUZANOV 1938, BĂNĂRESCU 1970, UDVARDI 1975, KRYZHANOVSKY 1980, 2002, VORONOV et al. 1985, SEDLAG & WEINER 1987, VORONOV 1987, LOPATIN 1989, GREHAN 1988, 1993) or further north: about 15-20°N (NEILL 1973, EMELJANOV 1974, PROCHEŞ & RAMDHANI 2012, HOLT et al. 2013, FICETOLA et al. 2017). Some authors (DARLINGTON 1957) include almost all of Africa, except for the Atlas Mountains, in the Afrotropical Region. In the Catalogue of Diptera of the Afrotropical Region (CROSSKEY 1980a) the border between the Palaearctic and Afrotropical Region includes entirely the countries Mauritania,

Mali, Niger, Chad and Sudan (CROSSKEY 1980a). In the Catalogue of the Palaearctic Diptera this border runs along the Northern Tropics – 23.3°N (SOÓS & PAPP 1992). Thus, for dipterans, the border is located at 800-1000 km north of the most southern parts of Sahara (along the southern borders of the Mediterranean countries). The position of the border between the two areas is related to the taxonomic groups used to specify it (LEME 1976). Studies, referring to this limit, are mainly on vertebrates. The lack of the geographical barriers allows the penetration of species to the south or north and mixing of the fauna from the two areas. The Mediterranean Palaearctic Subregion contains tropical taxa, the percentage of which varies in latitudinal direction. The mixing of the fauna is the reason for MÜLLER (1974, 1980) to accept the Mediterranean Africa (excluding the Atlas Mts. and the coast) as

a transitional zone between the two areas (zone of mixing of the fauna).

The aim of this article is to present the fauna of Tachinidae of the Mediterranean Africa and to analyse the penetration of tropical forms and mixing of the fauna.

Materials and Methods

For the border of the Mediterranean Africa and the Afrotropical Region, the line accepted by CROSSKEY (1980a) and O'HARA et al. (2020) that coincide with the northern borders of Mauritania, Mali, Niger, Chad and Sudan, was used. The northernmost points of this line are at 27.5°N (about 430 km north of the Tropic of Cancer) and the southernmost – at 18.5°N (about 520 km south of the Tropic of Cancer). The use of the administrative boundaries is necessary because in many publications the authors indicate the presence of the species in the respective countries without precise localities. The new publications, with the use of the Global Positioning System (GPS), have precise localities but the deserts and the situation in the Sahel Region make the research difficult.

The southern part of the Mediterranean Subregion is poorly studied and localities in this wide area from the Atlantic Ocean to the Red Sea are almost lacking. The study area is divided between 8 countries: Western Sahara, Morocco, Algeria, Tunisia, Libya, Egypt (up to the Suez Canal), Madeira Is. and the Canary Islands. In three of them (with the exception of 2 species), there is no information about the family Tachinidae.

The areographical categorisation of the species was made on the basis of current data about their distribution. A number of monographs and catalogues on the tachinids (MESNIL 1944-1975, 1980, GUIMARÃES 1971, CROSSKEY 1973, 1976, 1977, 1980b, 1984, HERTING 1983, CANTRELL & CROSSKEY 1989, HERTING & DELY-DRASKOVITS 1993, O'HARA & WOOD 2004, RICHTER 2004, CERRETTI 2005) and new publications from recent years have been used (PAPE et al. 2015, O'HARA & CERRETTI 2016, EL-HAWAGRY 2018, O'HARA & HENDERSON 2018, O'HARA et al. 2020, KETTANI et al. 2022). No catalogues have been used in which the distribution of the species is given up to the area level without more precise localisation.

The taxa found in the African part of the Mediterranean Subregion and their distribution beyond it are presented (Table 1). For each species an areographical characteristic is given, which reflects the current data on its distribution. The border be-

tween the Western and Eastern Palaearctic along the Yenisei River is accepted. The classification of the areas is based on the works of GEPTNER (1936), DARLINGTON (1957), KRYZHANOVSKY (1965, 1976, 1980, 2002), DE LATTIN (1967), MÜLLER (1974, 1980), UDVARDI (1975), CROSSKEY & WHITE (1977), MALICKY et al. (1983), GORODKOV (1984), GREHAN (1988, 1993), VIGNA TAGLIANTI et al. (1999), PROCHEŞ & RAMDHANI (2012), HOLT et al. (2013), FICETOLA et al. (2017) and EMELJANOV (2018). The distribution of the species according to the zoogeographical categories is scrutinised (Table 2). Zoogeographical analysis for the taxa categorisation was used. This method allows obtaining data information about species complexes with different zoogeographical characters based on the published data regarding species distribution and faunistic research. These complexes contain zoogeographical information about the taxonomic groups which, combined with the origin of the ranges, determines the zoogeographical character of the fauna.

Abbreviations used: **afm** – African-Mediterranean, **atafm** – Afrotropical-African-Mediterranean, **atlm** – Atlantic-Mediterranean, **atm** – Afrotropical-Mediterranean, **atmca** – Afrotropical-Mediterranean-Central Asian, **atmit** – Afrotropical-Mediterranean-Iran-Turanian, **atmt** – Afrotropical-Mediterranean-Turanian, **atsem** – Afrotropical-Southeast Mediterranean, **atsemca** – Afrotropical-Southeast Mediterranean-Central Asian, **atsm** – Afrotropical-South Mediterranean, **csena** – Central and South European-North African, **csename** – Central and South European-North African-Middle East, **dp** – Disjunct Palaearctic, **dpat** – Disjunct Palaearctic-Afrotropical, **dpo** – Disjunct Palaearctic-Oriental, **em** – East Mediterranean, **ena** – European-North African, **eswm** – European-Southwest Mediterranean, **h** – Holarctic, **h*** – species introduced in North America, **hn** – Holarctic-Neotropical, **hno** – Holarctic-Neotropical-Oriental, **ho** – Holarctic-Oriental, **hom** – Holomediterranean, **hop** – Holopalaearctic, **hpta** – Holarctic-Paleotropical-Australian, **k** – Cosmopolitan, **mca** – Mediterranean-Central Asian, **mcao** – Mediterranean-Central Asian-Oriental, **mi** – Mediterranean-Iranian, **mit** – Mediterranean-Iran-Turanian, **mt** – Mediterranean-Turanian, **mwca** – Mediterranean-West Central Asian, **osm** – Oriental-South Mediterranean, **oswm** – Oriental-Southwest Mediterranean, **pat** – Palaearctic-Afrotropical, **po** – Palaearctic-Oriental, **poa** – Palaearctic-Oriental-Australian, **ppt** – Palaearctic-Paleotropical, **ppta** – Palaearctic-Paleotropical-Australian, **ptm** – Paleotropical-Mediterranean, **ptmca** – Paleotropical-Mediterranean-Central Asian,

sem – Southeast Mediterranean, **semi** – Southeast Mediterranean-Iranian, **sena** – South European-North African, **senwaf** – South European-Northwest African, **sk** – Semicosmopolitan, **sm** – South Mediterranean, **smca** – South Mediterranean-Central Asian, **smi** – South Mediterranean-Iranian, **smtat** – South Mediterranean-Turanian-Afrotropical, **smwca** – South Mediterranean-West Central Asian, **sp** – South Palaearctic, **spat** – South Palaearctic-Afrotropical, **spo** – South Palaearctic-Oriental, **sppt** – South Palaearctic-Paleotropical, **sppta** – South Palaearctic-Paleotropical-Australian, **swp** – Southwest Palaearctic, **swppt** – Southwest Palaearctic-Paleotropical, **tp** – Transpalaearctic, **wafm** – West African-Mediterranean Mediterranean, **wcp** – West and Central Palaearctic, **wcpat** – West and Central Palaearctic-Afrotropical, **wm** – West Mediterranean, **wp** – West Palaearctic, **wpat** – West Palaearctic-Afrotropical, **wpo** – West Palaearctic-Oriental.

Results

A total of 260 tachinid species that belong to 122 genera and four subfamilies have been recorded from the Mediterranean part of Africa so far (Table 1). The most numerous is the subfamily Exoristinae (114), followed by Tachininae (69), Phasiinae (42) and Dexiinae (35). Many genera contain comparatively small number of species that is a typical feature of the family Tachinidae. In the study area, the richest genera include from 6 to 15 species. There are 7 (*Exorista* – 15 species, *Chetogena* – 11 species, *Drino*, *Gonia* and *Cylindromyia* – each 9 species, *Siphona* – 8 species and *Linnaemya* – 6 species) and 15 genera contain from 3 to 5 species (*Cestonia*, *Clemelis*, *Phytomyptera*, *Minthodes*, *Plesina*, *Rossimyiops*, *Peribaea*, *Peleteria*, *Tachina*, *Zeuxia*, *Periscepsia*, *Wagneria*, *Gymnosoma*, *Leucostoma* and *Phasia*). The above-mentioned 22 genera include 122 species or 46.9% of all tachinids. Some larger genera of the European tachinids are poorly or not presented (*Phryxe*, *Carcelia*, *Senometopia*, *Winthemia*, *Loewia*, *Macquartia*, *Bithia*, *Billaea*, *Besseria* and *Phania*).

The tachinid fauna of the Mediterranean Africa is insufficiently studied. This can be seen when looking at separate countries. No tachinids have been reported from the Western Sahara. Few species are known from Libya and Madeira Is. Most species are reported from Morocco – 147, Egypt – 72, followed by Algeria – 60, Canary Islands – 58 and Tunisia – 38. It is expected, in this vast area with a variety of natural conditions, the number of known species to increase as a results of further studies. By com-

parison with the fauna of the close parts of Southern Europe, such as Italy – 644 species (CERRETTI & ZIEGLER 2004, CERRETTI 2010) and the Balkan Peninsula – 620 species (HUBENOV 2008, LUTOVINOVAS et al. 2022), almost three times fewer species of the family Tachinidae have been established in the Mediterranean Africa.

Discussion

In Morocco, Algeria and Tunisia, there is a declining tendency in the level of research from north to south and from the coast and the Atlas Mts. to the inner parts of the countries. Most species are collected near the Mediterranean coast or in the Atlas Mountains. An exception of this tendency is Egypt, where the Nile River valley provides good working conditions and penetration to the south. The great distances and unfavourable conditions in the deserts of the inland of the mentioned countries make it difficult for material to be collected. The tendency is reversed in the tropical Africa: there is no information from Mauritania, Niger and Chad, three species are known from Mali and 42 from Sudan (mainly from the Nile Valley). The rich tropical African fauna appears further south. There is a wide strip from the Atlantic to the Red Sea (most of the Sahara and the countries of the Sahel zone – Mauritania, Mali, Niger, Chad and Sudan), from which there are no data on the family Tachinidae. This area (with severe exploration conditions) is a barrier to the penetration of the African tropical tachinids to the north. This can be supposed, bearing in mind that only five African tropical forms are known from the Mediterranean Subregion: *Metacemya calloti* (Séguy, 1936), *Cestonia rutilans* Villeneuve, 1929, *Drino latigena* (Mesnil, 1944), *Pseudogonia fasciata* (Wiedemann, 1819) and *Mintho compressa* (Fabricius, 1787). In the case of the family Tachinidae, the conception of MÜLLER (1974, 1980) for a transitional zone in the Mediterranean Africa (mixing of the fauna with tropical African taxa) is not confirmed. It is not clear how *Pseudogonia fasciata* and *Mintho compressa* had penetrated the Mediterranean Subregion. *Metacemya calloti*, *Cestonia rutilans* and *Drino latigena* are known from the tropical Africa and the Asian part of the Afrotropical Region (United Arab Emirates, Yemen and Oman). Further 13 afrotropical and paleotropical taxa have been established (Table 1) which are not distributed in the tropical Africa but are known from the Asian part of the Afrotropical Region. Some of them – the paleotropical forms, are distributed in the Oriental Region too [*Cylindromyia rubida* (Loew, 1854), *Cylindromyia rufipes* (Mei-

Table 1. Species composition and distribution of the family Tachinidae (Diptera) of the African part of the Mediterranean Subregion

Note. + – presence of the species, ? – probable category, ● – African tropical taxa, * – Taxa, known from the Afrotropical Region, which are not established in Tropical Africa (known from Oman, U.A. Emirates or Yemen), ◆ – species, found only in the Mediterranean Africa.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
Exoristinae				
<i>Acemya acuticornis</i> (Meigen, 1824)	+		+	tp
<i>Ceracia mucronifera</i> Rondani, 1865	+	+	+	ptm
<i>Metacemya calloti</i> (Séguy, 1936)	+	+●	+	atm
<i>Blondelia vexillaria</i> (Villeneuve, 1922)	+◆			afm
<i>Compsilura concinnata</i> (Meigen, 1824)	+	+	+	hpta, sk, i
<i>Istocheta barbara</i> (Mesnil, 1961)	+◆			wafm
<i>Istocheta cinerea</i> (Macquart, 1850)	+		+	csena, ? hom, swp
<i>Istocheta longicornis</i> (Fallén, 1810)	+		+	? dp
<i>Lomachantha parra</i> Rondani, 1859	+		+	? wp
<i>Robinaldia angustata</i> (Villeneuve, 1933)	+		+	atlm
<i>Zaira cinerea</i> (Fallén, 1820)	+		+	tp
<i>Steleoneura czernyi</i> Stein, 1924	+		+	mca
<i>Alsomyia olfaciens</i> (Pandellé, 1896)	+		+	dp
<i>Amphicestonia dispar</i> Villeneuve, 1939	+		+	mca
<i>Aplomya confinis</i> (Fallén, 1820)	+	+	+	ppt
<i>Aplomya metallica</i> (Wiedemann, 1824)	+	+	+	sppta
<i>Cadurciella tritaeniata</i> (Rondani, 1859)	+		+	dp
<i>Carcelia dilaticornis</i> Mesnil, 1950	+◆			wafm
<i>Carcelia iliaca</i> (Ratzeburg, 1840)	+		+	csena
<i>Carcelia lucorum</i> (Meigen, 1824)	+		+	po
<i>Cestonia canariensis</i> Villeneuve, 1936	+	+*	+	atasm
<i>Cestonia cineraria</i> Rondani, 1861	+		+	hom
<i>Cestonia rutilans</i> Villeneuve, 1929	+	+●		atafm
<i>Cestonionerva petiolata</i> (Villeneuve, 1910)	+	+*	+	spat
<i>Cestonioptera mesnili</i> Villeneuve, 1939	+		+	sm
<i>Drino atopivora</i> (Robineau-Desvoidy, 1830)	+	+	+	sppta, ? ppta
<i>Drino galii</i> (Brauer & Bergenstamm, 1891)	+		+	? tp
<i>Drino gilva</i> (Hartig, 1838)	+		+	dp
<i>Drino imberbis</i> (Wiedemann, 1830)	+	+	+	atmit
<i>Drino inconspicua</i> (Meigen, 1830)	+		+	po
<i>Drino latigena</i> (Mesnil, 1944)	+	+●	+	atasm
<i>Drino maroccana</i> Mesnil, 1951	+		+	sena
<i>Drino triplaca</i> Herting, 1979	+◆			wafm
<i>Drino vicina</i> (Zetterstedt, 1849)	+		+	wp, ? wcp
<i>Gymnophryxe carthaginiensis</i> (Bischof, 1900)	+		+	spo, ? mcao
<i>Gymnophryxe nudigena</i> (Villeneuve, 1922)	+		+	sm
<i>Lasiopales pachychaeta</i> (Villeneuve, 1922)	+◆			afm
<i>Nilea innoxia</i> Robineau-Desvoidy, 1863	+		+	? tp
<i>Phryxe caudata</i> (Rondani, 1859)	+		+	hom, ? mi
<i>Phryxe setifacies</i> (Villeneuve, 1910)	+		+	csena
<i>Phryxe vulgaris</i> (Fallén, 1810)	+		+	ho
<i>Ptesiomyia microstoma</i> Brauer & Bergenstamm, 1893	+◆			afm
<i>Senometopia separata</i> (Rondani, 1859)	+		+	po

Table 1. Continuation.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
<i>Thecocarcelia acutangulata</i> (Macquart, 1850)	+	+	+	dpat, ? spat
<i>Tryphera lugubris</i> (Meigen, 1824)	+		+	wcp
<i>Atylomyia albifrons</i> Villeneuve, 1911	+		+	sp
<i>Alloprosopaea algerica</i> Mesnil, 1961	+		+	dp
<i>Alloprosopaea efflatouni</i> Villeneuve, 1923	+		+	sm
<i>Bessa parallela</i> (Meigen, 1824)	+		+	po
<i>Chetogena acuminata</i> Rondani, 1859	+	+	+	ppt
<i>Chetogena aegyptiaca</i> (Villeneuve, 1923)	+		+	sem
<i>Chetogena barbara</i> (Mesnil, 1939)	+♦			afm
<i>Chetogena cercosa</i> Kugler, 1980	+	+*	+	atsem
<i>Chetogena filipalpis</i> Rondani, 1859	+		+	wcp
<i>Chetogena mageritensis</i> (Villeneuve & Mesnil, 1936)	+		+	wm
<i>Chetogena media</i> Rondani, 1859	+		+	dp
<i>Chetogena nigrofasciata</i> (Strobl, 1902)	+	+	+	atmca
<i>Chetogena obliquata</i> (Fallén, 1810)	+		+	wcp, ? tp
<i>Chetogena siciliensis</i> (Villeneuve, 1924)	+		+	mca
<i>Chetogena sinaica</i> (Villeneuve, 1909)	+		+	? em
<i>Chaetoria stylata</i> Becker, 1908	+	+	+	atmit
<i>Exorista deligata</i> Pandellé, 1896	+		+	wp
<i>Exorista fasciata</i> (Fallén, 1820)	+		+	po
<i>Exorista grandis</i> (Zetterstedt, 1844)	+		+	wp
<i>Exorista kugleri</i> Mesnil, 1960	+		+	mca
<i>Exorista lacteipennis</i> Mesnil, 1970	+		+	sm
<i>Exorista larvarum</i> (Linnaeus, 1758)	+		+	ho
<i>Exorista nova</i> (Rondani, 1859)	+		+	? wp
<i>Exorista rendina</i> (Herting, 1975)	+		+	hom
<i>Exorista rustica</i> (Fallén, 1810)	+		+	po
<i>Exorista rutilans</i> Mesnil, 1970	+		+	semi
<i>Exorista securicornis</i> Mesnil, 1941	+		+	smi
<i>Exorista segregata</i> (Rondani, 1859)	+		+	? mca
<i>Exorista sorbillans</i> (Wiedemann, 1830)	+	+	+	sppta, ? ppta
<i>Exorista tessellans</i> Mesnil, 1939	+	+	+	atmca
<i>Exorista xanthaspis</i> (Wiedemann, 1830)	+	+	+	ppta
<i>Maculosalia maculosa</i> (Villeneuve, 1909)	+		+	smi
<i>Neophryxe vallina</i> (Rondani, 1861)	+		+	csena
<i>Anurophylla aprica</i> (Villeneuve, 1913)	+♦			wafm
<i>Baumhaueria goniaeformis</i> (Meigen, 1824)	+		+	wp
<i>Blepharipa pratensis</i> (Meigen, 1824)	+	+	+	pat, h*
<i>Ceratochaetops trisetata</i> (Villeneuve, 1922)	+		+	h
<i>Ceromasia rubrifrons</i> (Macquart, 1834)	+		+	tp
<i>Clemelis apicalis</i> (Villeneuve, 1923)	+		+	sena
<i>Clemelis gymnops</i> Herting, 1975	+		+	? mca, ? dp
<i>Clemelis massilia</i> Herting, 1977	+		+	hom
<i>Clemelis pullata</i> (Meigen, 1824)	+		+	tp, ? wcp
<i>Elodia atricans</i> (Herting, 1975)	+		+	hom
<i>Erynnia ocypterata</i> (Fallén, 1810)	+		+	dp
<i>Eumeella perdives</i> (Villeneuve, 1926)	+		+	hom
<i>Gaedia connexa</i> Meigen, 1824	+		+	ena

Table 1. Continuation.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
<i>Gonia aterrima</i> Tschorsnig, 1991	+♦			wafm
<i>Gonia atra</i> Meigen, 1826	+		+	ho, ? spo
<i>Gonia bimaculata</i> Wiedemann, 1819	+	+	+	sppt
<i>Gonia capitata</i> (De Geer, 1776)	+		+	tp, ? wcp
<i>Gonia maculipennis</i> Egger, 1862	+		+	mca
<i>Gonia ornata</i> Meigen, 1826	+		+	tp
<i>Gonia quadrisetosa</i> Becker, 1908	+♦			wafm
<i>Gonia vacua</i> Meigen, 1826	+		+	tp
<i>Gonia umbripennis</i> Herting, 1958	+		+	smi
<i>Mendelsohnia sinaica</i> Kugler, 1971	+		+	sem
<i>Nealsomyia triseriella</i> (Villeneuve, 1929)	+		+	sem
<i>Pales cyanea</i> (Macquart, 1839)	+♦			wafm
<i>Pales pavidata</i> (Meigen, 1824)	+		+	po
<i>Platymya antennata</i> (Brauer & Bergenstamm, 1891)	+		+	wcp
<i>Prosopodopsis appendiculata</i> (de Meijere, 1910)	+		+	oswm
<i>Pseudogonia fasciata</i> (Wiedemann, 1819)	+	+●	+	atm
<i>Pseudogonia rufifrons</i> (Wiedemann, 1830)	+	+	+	ppta
<i>Ramonella mesnili</i> (Kugler, 1980)	+	+*	+	atm
<i>Rhynchogonia algerica</i> Brauer & Bergenstamm, 1893	+	+*	+	atsmt
<i>Spallanzania rectistylum</i> (Macquart, 1847)	+		+	mi
<i>Sturmia bella</i> (Meigen, 1824)	+		+	poa
<i>Synamphichaeta tricincta</i> Villeneuve, 1936	+♦			wafm
<i>Nemorilla floralis</i> (Fallén, 1810)	+	+	+	pat
<i>Nemorilla maculosa</i> (Meigen, 1824)	+		+	po
Tachininae				
<i>Lissoglossa bequaerti</i> Villeneuve, 1913	+♦			afm
<i>Lissoglossa taeniata</i> Villeneuve, 1913	+♦			afm
<i>Trichactia nubilinervis</i> Becker, 1908	+♦			wafm
<i>Linnaemya castellana</i> (Strobl, 1906)	+		+	dp, mca
<i>Linnaemya comta</i> (Fallén, 1810)	+		+	hno, ? sk
<i>Linnaemya dumonti</i> Mesnil, 1971	+		+	sm
<i>Linnaemya latigena</i> Kugler, 1977	+	+*	+	atsem
<i>Linnaemya petiolata</i> Kugler, 1971	+		+	sem
<i>Linnaemya soror</i> Zimin, 1954	+		+	po
<i>Graphogaster inflata</i> (Bischof, 1900)	+♦			afm
<i>Graphogaster vestita</i> Rondani, 1868	+		+	hom, mi
<i>Phytomyptera lacteipennis</i> Villeneuve, 1934	+	+*	+	wcpat
<i>Phytomyptera nigrina</i> (Meigen, 1824)	+		+	wcp
<i>Phytomyptera vaccinii</i> Sintenis, 1897	+		+	ena
<i>Aphria longirostris</i> (Meigen, 1824)	+		+	wcp
<i>Aphria rubida</i> Mesnil, 1973	+♦			afm
<i>Bithia demotica</i> (Egger, 1861)	+		+	dp
<i>Bithia modesta</i> (Meigen, 1824)	+		+	mca
<i>Gymnochaeta viridis</i> Fallén, 1810	+		+	tp
<i>Loewia setibarba</i> Egger, 1856	+		+	ena
<i>Panzeria castellana</i> (Strobl, 1906)	+		+	mca
<i>Panzeria nemorum</i> (Meigen, 1824)	+		+	tp
<i>Zophomyia temula</i> (Scopoli, 1763)	+		+	tp

Table 1. Continuation.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
<i>Macquartia chalconota</i> (Meigen, 1824)	+		+	wcp
<i>Macquartia macularis</i> Villeneuve, 1926	+		+	dp
<i>Macquartia tessellum</i> (Meigen, 1824)	+		+	spo
<i>Microphthalma europaea</i> Egger, 1860	+		+	wpo
<i>Hyperaea femoralis</i> (Meigen, 1824)	+		+	wm, ? senwaf
<i>Hyperaea fuscipennis</i> (Macquart, 1849)	+♦			afm
<i>Mintho compressa</i> (Fabricius, 1787)	+	+●	+	atm
<i>Mintho praeceps</i> (Scopoli, 1763)	+		+	hom
<i>Mintho rufiventris</i> (Fallén, 1817)	+		+	tp
<i>Minthodes diversipes</i> (Strobl, 1899)	+		+	hom
<i>Minthodes numidica</i> Villeneuve, 1932	+		+	wm
<i>Minthodes setifacies</i> Mesnil, 1939	+♦			wafm
<i>Plesina claripennis</i> Mesnil, 1953	+		+	hom
<i>Plesina deserticola</i> Kugler, 1978	+		+	sem
<i>Plesina phalerata</i> (Meigen, 1824)	+		+	wm
<i>Rossimyops achilleae</i> (Kugler, 1972)	+		+	sem
<i>Rossimyops djerbaensis</i> Cerretti, 2009	+♦			afm
<i>Rossimyops magnificus</i> (Kugler, 1972)	+		+	sem
<i>Neoplectops pomonellae</i> (Schnabl & Mokrzecki, 1903)	+		+	dp
<i>Nemoraea pellucida</i> (Meigen, 1824)	+		+	po
<i>Nemoraea piligena</i> Mesnil, 1971	+♦			afm
<i>Actia crassicornis</i> (Meigen, 1824)	+		+	po
<i>Actia infantula</i> (Zetterstedt, 1844)	+		+	wcp
<i>Peribaea apicalis</i> Robineau-Desvoidy, 1863	+		+	tp
<i>Peribaea orbata</i> (Wiedemann, 1830)	+	+	+	sppta
<i>Peribaea palaestina</i> (Villeneuve, 1934)	+	+*	+	atsemca
<i>Peribaea tibialis</i> (Robineau-Desvoidy, 1851)	+	+	+	ppt, ? po
<i>Siphona confusa</i> Mesnil, 1961	+		+	po
<i>Siphona efflatouni</i> Mesnil, 1960	+		+	sem
<i>Siphona geniculata</i> (De Geer, 1776)	+		+	ho, h*
<i>Siphona jocosa</i> (Villeneuve, 1942)	+		+	wm
<i>Siphona maroccana</i> Cerretti & Tschorsnig, 2007	+♦			wafm
<i>Siphona rossica</i> Mesnil, 1961	+		+	tp
<i>Siphona seyrigi</i> Mesnil, 1960	+♦			wafm
<i>Siphona variata</i> Andersen, 1982	+		+	wp
<i>Laufferiella nigrescens</i> Tschorsnig, 1997	+♦			afm
<i>Germaria barbara</i> Mesnil, 1963	+		+	wm
<i>Peleteria iavana</i> (Wiedemann, 1819)	+	+	+	ppta
<i>Peleteria meridionalis</i> (Robineau-Desvoidy, 1830)	+		+	mca, ? wp
<i>Peleteria ruficornis</i> (Macquart, 1835)	+	+	+	wpat
<i>Tachina canariensis</i> (Macquart, 1839)	+♦			wafm
<i>Tachina corsicana</i> (Villeneuve, 1931)	+		+	mca, sp
<i>Tachina fera</i> (Linnaeus, 1761)	+		+	hop
<i>Tachina magnicornis</i> (Zetterstedt, 1844)	+			hop
<i>Tachina praeceps</i> Meigen, 1824	+		+	tp
Dexiinae				
<i>Billaea lata</i> (Macquart, 1849)	+		+	wm
<i>Estheria atripes</i> Villeneuve, 1920	+♦			wafm

Table 1. Continuation.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
<i>Estheria crosi</i> (Villeneuve, 1920)	+♦			wafm
<i>Estheria iberica</i> Tschorsnig, 2003	+		+	wm
<i>Estheria lesnei</i> (Villeneuve, 1913)	+♦			wafm
<i>Estheria nigripes</i> (Villeneuve, 1920)	+		+	sp
<i>Estheria simonyi</i> (Brauer & Bergenstamm, 1891)	+♦			wafm
<i>Trixiceps magnipalpis</i> (Bezzi, 1922)	+		+	hom
<i>Zeuxia aberrans</i> (Loew, 1847)	+		+	mwca
<i>Zeuxia cinerea</i> Meigen, 1826	+		+	wp
<i>Zeuxia rubrapex</i> Mesnil, 1963	+♦			wafm
<i>Rondania insularis</i> (Bigot, 1891)	+		+	eswm, ? ena
<i>Euthera fascipennis</i> (Loew, 1854)	+	+	+	ptmca
<i>Campylocheta inepta</i> (Meigen, 1824)	+		+	wcp
<i>Eriothrix apennina</i> (Rondani, 1862)	+		+	wcp
<i>Eriothrix rufomaculata</i> (De Geer, 1776)	+		+	tp, ? hop
<i>Hypovoria hilaris</i> (Villeneuve, 1913)	+		+	wcp, ? tp
<i>Hypovoria pilibasis</i> (Villeneuve, 1922)	+		+	hom
<i>Kirbya moerens</i> (Meigen, 1830)	+		+	ena
<i>Nanoplagia sinaica</i> (Villeneuve, 1909)	+		+	wcp
<i>Periscepsia handlirschi</i> (Brauer & Bergenstamm, 1891)	+		+	po, ? spo
<i>Periscepsia meyeri</i> (Villeneuve, 1930)	+		+	osm
<i>Periscepsia prunicia</i> (Herting, 1969)	+		+	tp
<i>Stomina angustifrons</i> Kugler, 1968	+		+	spo
<i>Stomina caliendrata</i> (Rondani, 1862)	+		+	swp, ? wp
<i>Thelaira haematodes</i> (Meigen, 1824)	+		+	wcp
<i>Dufouria nigrita</i> (Fallén, 1810)	+		+	wcp
<i>Uclesia fumipennis</i> Girschner, 1901	+		+	wm
<i>Uclesia petiolata</i> (Villeneuve, 1929)	+		+	smca, ? smwca
<i>Voria ruralis</i> (Fallén, 1810)	+	+	+	k
<i>Wagneria albifrons</i> Kugler, 1977	+		+	hom
<i>Wagneria cunctans</i> (Meigen, 1824)	+		+	csena
<i>Wagneria dilatata</i> Kugler, 1977	+		+	sm
<i>Athrycia trepida</i> (Meigen, 1824)	+		+	tp
<i>Cyrtophloebe ruricola</i> (Meigen, 1824)	+		+	tp
Phasiinae				
<i>Catharosia albisquama</i> (Villeneuve, 1932)	+		+	swp, ? csename
<i>Besseria anthophila</i> (Loew, 1871)	+		+	h
<i>Besseria lateritia</i> (Meigen, 1824)	+		+	mit
<i>Cylindromyia auriceps</i> (Meigen, 1838)	+		+	tp
<i>Cylindromyia aurora</i> Herting, 1985	+		+	wm
<i>Cylindromyia bicolor</i> (Olivier, 1812)	+		+	swp
<i>Cylindromyia brassicaria</i> (Fabricius, 1775)	+		+	po, ? hop
<i>Cylindromyia intermedia</i> (Meigen, 1824)	+		+	hn
<i>Cylindromyia maroccana</i> Tschorsnig, 1997	+♦			wafm
<i>Cylindromyia pilipes</i> (Loew, 1844)	+		+	wcp
<i>Cylindromyia rubida</i> (Loew, 1854)	+	+*	+	swppt
<i>Cylindromyia rufipes</i> (Meigen, 1824)	+	+*	+	swppt
<i>Hemyda obscuripennis</i> (Meigen, 1824)	+		+	dpo
<i>Phania albisquama</i> (Villeneuve, 1924)	+		+	? hom

Table 1. Continuation.

Taxa	Distribution of the species			
	African Mediterranean Subregion	Afrotropical Region	Other areas	Areographical categories
<i>Clytiomya continua</i> (Panzer, 1798)	+		+	tp
<i>Clytiomya sola</i> (Rondani, 1861)	+		+	hom
<i>Ectophasia crassipennis</i> (Fabricius, 1794)	+		+	tp
<i>Eliozeta helluo</i> (Fabricius, 1805)	+		+	tp
<i>Gymnosoma carporidis</i> Dupuis, 1961	+		+	atlm
<i>Gymnosoma clavatum</i> (Rohdendorf, 1947)	+		+	tp
<i>Gymnosoma dolycoridis</i> Dupuis, 1960	+		+	po
<i>Gymnosoma rotundatum</i> Linnaeus, 1758	+		+	po
<i>Gymnosoma rungsi</i> (Mesnil, 1952)	+		+	swp, ? mwca
<i>Dionomelia hennigi</i> Kugler, 1978	+	+	+	atm
<i>Eulabidogaster setifacies</i> (Rondani, 1861)	+		+	wcp
<i>Labigastera latiforceps</i> Tschorsnig, 2000	+		+	wm
<i>Labigastera nitidula</i> (Meigen, 1824)	+		+	swp, ? mt
<i>Clairvillia biguttata</i> (Meigen, 1824)	+		+	dp
<i>Leucostoma abbreviatum</i> Herting, 1971	+		+	mit
<i>Leucostoma crassa</i> Kugler, 1966	+		+	dp,
<i>Leucostoma engeddense</i> Kugler, 1966	+	+	+	atm
<i>Leucostoma obsidianum</i> (Wiedemann, 1830)	+	+	+	atmt
<i>Leucostoma tetraptera</i> (Meigen, 1824)	+	+	+	pat
<i>Weberia digramma</i> (Meigen, 1824)	+		+	mt
<i>Elomya lateralis</i> (Meigen, 1824)	+		+	tp
<i>Phasia mesnili</i> (Draber-Moňko, 1965)	+	+	+	spat
<i>Phasia obesa</i> (Fabricius, 1798)	+		+	tp, ? hop
<i>Phasia pusilla</i> Meigen, 1824	+		+	po
<i>Phasia subcoleoprata</i> (Linnaeus, 1767)	+		+	tp
<i>Phasia venturii</i> (Draber-Moňko, 1965)	+		+	sena
<i>Trichopoda pennipes</i> (Fabricius, 1794)	+	+	+	sk
<i>Xysta holosericea</i> (Fabricius, 1805)	+		+	mi
Total	260	44	228	

gen, 1824)]. Other species are more widely distributed in the Palearctic and especially in its southern parts (the south parts of Europe and the Central Asian Subregion). These forms probably had penetrated the Mediterranean Africa from the east (or along the Mediterranean Sea). There the coast and the Nile Valley provide corridors for the distribution of the fauna and its study. For some species (*Cestonia rutilans*, also known from Senegal in West Africa), the Atlantic coast is a probable possibility of penetration to the north. The Atlas Mountains can be considered as a center of formation of a specific Montane-Mediterranean fauna.

The zoogeographical categorisation of the species was done on the basis of current data about their distribution. Thus the tachinids are divided into 61

areographical categories, combined into two large groups and four complexes (Table 2).

Species distributed in the Palearctic and beyond it. This group (77 species or 29.6%) includes 35 zoogeographical categories, of which 17 combine species of northern type (43 species – 16.5%, widely distributed in the Holarctic, Palearctic and other areas) and 18 – species of southern type (34 species or 13.1%, distributed only in the southern Palearctic). It is accepted that the taxa of the northern type have vast areas and ecological flexibility. In the Super-Palearctic group, the Palearctic-Oriental (17 species – 6.5%) and the Afrotropical-Mediterranean (6 species – 2.3%) taxa prevail. When compared to the fauna of the Balkan Peninsula (HUBENOV 2008), there is a significant difference. In the Balkan tachi-

Table 2. Zoogeographical characteristic of the family Tachinidae (Diptera) of the African part of the Mediterranean Subregion

Areographical categories	African Mediterranean Subregion	Afrotropical Region	Other areas
Species distributed in Palaearctic and out of it	77 (29.6)	44 (100.0)	76 (33.3)
NORTH TYPE	43 (16.5)	15 (34.1)	43 (18.9)
Cosmopolitan	1 (0.4)	1 (2.3)	1 (0.4)
Semicosmopolitan	1 (0.4)	1 (2.3)	1 (0.4)
Holarctic-Paleotropical-Australian	1 (0.4)	1 (2.3)	1 (0.4)
Holarctic-Neotropical-Oriental	1 (0.4)		1 (0.4)
Holarctic-Neotropical	1 (0.4)		1 (0.4)
Holarctic-Oriental	4 (1.5)		4 (1.8)
Holarctic	2 (0.8)		2 (0.9)
Palaearctic-Paleotropical-Australian	3 (1.2)	3 (6.8)	3 (1.3)
Palaearctic-Oriental-Australian	1 (0.4)		1 (0.4)
Palaearctic-Paleotropical	3 (1.2)	3 (6.8)	3 (1.3)
Palaearctic-Oriental	17 (6.5)		17 (7.5)
West Palaearctic-Oriental	1 (0.4)		1 (0.4)
Palaearctic-Afrotropical	3 (1.2)	3 (6.8)	3 (1.3)
West and Central Palaearctic-Afrotropical	1 (0.4)	1 (2.3)	1 (0.4)
West Palaearctic-Afrotropical	1 (0.4)	1 (2.3)	1 (0.4)
Disjunct Palaearctic-Afrotropical	1 (0.4)	1 (2.3)	1 (0.4)
Disjunct Palaearctic-Oriental	1 (0.4)		1 (0.4)
SOUTH TYPE	34 (13.1)	29 (65.9)	33 (14.5)
South Palaearctic-Paleotropical-Australian	4 (1.5)	4 (9.1)	4 (1.8)
South Palaearctic-Paleotropical	1 (0.4)	1 (2.3)	1 (0.4)
Southwest Palaearctic-Paleotropical	2 (0.8)	2 (4.5)	2 (0.9)
Paleotropical-Mediterranean-Central Asian	1 (0.4)	1 (2.3)	1 (0.4)
Paleotropical-Mediterranean	1 (0.4)	1 (2.3)	1 (0.4)
South Palaearctic-Afrotropical	2 (0.8)	2 (4.5)	2 (0.9)
South Palaearctic-Oriental	3 (1.2)		3 (1.3)
Oriental-South Mediterranean	1 (0.4)		1 (0.4)
Oriental-Southwest Mediterranean	1 (0.4)		1 (0.4)
Afrotropical-Mediterranean-Central Asian	2 (0.8)	2 (4.5)	2 (0.9)
Afrotropical-Southeast Mediterranean-Central Asian	1 (0.4)	1 (2.3)	1 (0.4)
Afrotropical-Mediterranean-Iran-Turanian	2 (0.8)	2 (4.5)	2 (0.9)
Afrotropical-Mediterranean-Turanian	1 (0.4)	1 (2.3)	1 (0.4)
Afrotropical-South Mediterranean-Turanian	1 (0.4)	1 (2.3)	1 (0.4)
Afrotropical-Mediterranean	6 (2.3)	6 (13.6)	6 (2.6)
Afrotropical-South Mediterranean	2 (0.8)	2 (4.5)	2 (0.9)
Afrotropical-Southeast Mediterranean	2 (0.8)	2 (4.5)	2 (0.9)
Afrotropical-African-Mediterranean	1 (0.4)	1 (2.3)	
Species with Palaearctic distribution	183 (70.4)		152 (66.7)
PALAEARCTIC TYPE	77 (29.6)		77 (33.8)
Holopalaearctic	2 (0.8)		2 (0.9)
Transpalaearctic	27 (10.4)		27 (11.8)
West and Central Palaearctic	16 (6.2)		16 (7.0)
West Palaearctic	8 (3.1)		8 (3.5)
Disjunct Palaearctic	12 (4.6)		12 (5.3)
South Palaearctic	2 (0.8)		2 (0.9)
Southwest Palaearctic	5 (1.9)		5 (2.2)
European-North African	4 (1.5)		4 (1.8)
European-Southwest Mediterranean	1 (0.4)		1 (0.4)
MEDITERRANEAN TYPE	106 (40.8)		75 (32.9)
Mediterranean-Central Asian	11 (4.2)		11 (4.8)
South Mediterranean-Central Asian	1 (0.4)		1 (0.4)

Table 2. Continuation.

Areographical categories	African Mediterranean Subregion	Afrotropical Region	Other areas
Mediterranean-West Central Asian	1 (0.4)		1 (0.4)
Mediterranean-Iran-Turanian	2 (0.8)		2 (0.9)
Mediterranean-Iranian	3 (1.2)		3 (1.3)
Mediterranean-Turanian	1 (0.4)		1 (0.4)
South Mediterranean-Iranian	3 (1.2)		3 (1.3)
Southeast Mediterranean-Iranian	1 (0.4)		1 (0.4)
Central and South European-North African	5 (1.9)		5 (2.2)
South European-North African	3 (1.2)		3 (1.3)
Holomediterranean	15 (5.8)		15 (6.6)
South Mediterranean	6 (2.3)		6 (2.6)
West Mediterranean	12 (4.6)		12 (5.3)
Atlantic-Mediterranean	2 (0.8)		2 (0.9)
African-Mediterranean	12 (4.6)		
West African-Mediterranean	19 (7.3)		
East Mediterranean	1 (0.4)		1 (0.4)
Southeast Mediterranean	8 (3.1)		8 (3.5)
Total	260	44 (16.9)	228 (87.7)

nid fauna, this group is small (5.8%) and without determinant importance for the zoogeographical characteristics. In the Mediterranean Africa, this group is very well represented and includes a significant percentage of the species. Among the taxa with distribution in the Afrotropical Segion, the southern type is significantly better represented than the northern one and includes 65.9% of the species. In the case of taxa represented beyond the explored area, the two complexes are equal.

Species distributed only in the Palaearctic but in more than one subregion (Palaearctic type). Taxa, whose areas include more than one Palaearctic Subregion in latitudinal direction belong to this group. They are well represented in the high mobile groups and comprise about 20-25% of the species composition. A total of 77 (29.6%) species belong to this group and are organised into nine areographical categories. For the taxa represented beyond the explored area, the percentage increases – 33.8%. The character of the Palaearctic complex is determined by the Transpalaearctic (27 species or 10.4%), West and Central Palaearctic (16 species or 6.2%) and West Palaearctic (8 species or 3.1%) species. Twelve species (4.6%) have a longitudinal disjunction of the areas with regard to Siberia and Central Asia. Probably some of these species are presented with sparse populations and will be studied in more detail as a result of further research. When compared with the Balkan fauna, there is no significant difference (there the complex

includes 20.6% of the species). The vast areas and wide vertical distribution of the taxa of this group are an indication of the greater ecological flexibility of its species. Often, owing to the lack of sufficient research and the non-systematic material collecting, more common and widespread Palaearctic species have been collected.

Species distributed within one subregion of the Palaearctic. The Mediterranean-Central Asian species are also included here according to KRYZHANOVSKY (1965, 2002) and LOPATIN (1989), who combine the Mediterranean and Central Asian Subregions. The Mediterranean species form the largest complex in the Mediterranean Africa – 106 species (40.8%) of 18 areographical categories. On the Balkan Peninsula the considered group includes (4.9-24.5%) of the species of the separate countries. The ranges of the Mediterranean species are various and are divided into subgroups with different origin, distribution and ecological characteristics of the taxa. The Mediterranean complex of North Africa includes a significant group of taxa, typical only for it: the African-Mediterranean and West African-Mediterranean (a total of 31 species or 11.9%) taxa. At this stage, they can be considered endemics from the studied area. From the other areographical categories, the Holomediterranean (15 species or 5.8%) and West Mediterranean (12 species or 4.6%) species are the most numerous. The Mediterranean-Central Asian and Southeast Mediterranean forms are well represented.

It is difficult to define species with an Eurosiberian type of distribution, typical of the high mountains of the Southern Europe, from the tachinids found in the Mediterranean Africa so far. They are probably represented in the high parts of the Atlas Mts. but must be distinguished from the Montane-Mediterranean forms.

Conclusion

The data about the Tachinidae family from the Mediterranean Africa are not complete enough for zoogeographical conclusions. The limiting role of the deserts, both in the migration of tropical forms from south to north and the exploration of these areas is conspicuous. There are parts with a better research of the fauna, e.g. the Nile Valley, the Atlas Mts. and the Mediterranean coast. The inner parts of the Mediterranean Africa remain unexplored. The tachinid fauna can be divided into two main groups: 1) species with Mediterranean type of distribution (140 species or 53.8%): more thermophilic and distributed mainly in the southern parts of the Palaearctic. The species of the southern type, distributed in the Palaearctic and beyond it, can be formally related to this group as well; 2) species with Holarctic and Palaearctic type of distribution (120 species or 46.2%): more cold-resistant and widely distributed in the Palaearctic. The species of the northern type, distributed in the Palaearctic and beyond it, can be formally related to this group as well. The zoogeographical character of the family Tachinidae is determined by the first group (inversely to the southern European countries where the species with Palaearctic and Eurosiberian type of distribution prevail). The West African-Mediterranean and Holomediterranean forms are the most numerous in the first group. The Palaearctic-Oriental and Transpalaearctic taxa prevail in the second group. A total of 31 species are endemics for the Mediterranean Africa.

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Received: 12.01.2022
Accepted: 02.03.2022

